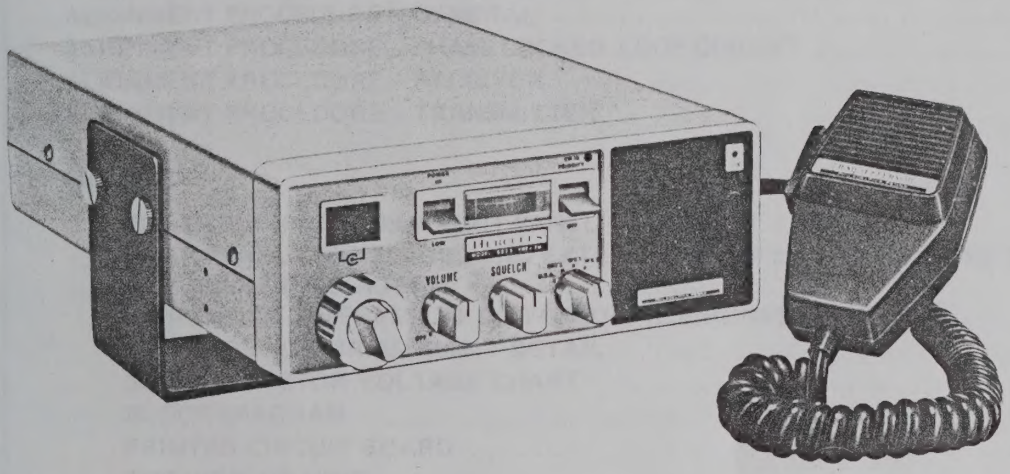
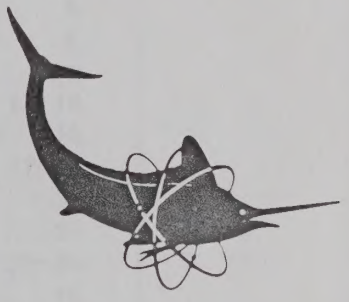
MARINE RADIO TELEPHONE MODEL 5525 "HERCULES" VHF/FM

WITH PHASE LOCK LOOP





INSTRUCTION HANDBOOK

PRICE
FIVE DOLLARS

RAY JEFFERSON
PHILADELPHIA, PENNSYLVANIA
DIVISION OF JETRONIC INDUSTRIES, INC.

RADIO DEL REY
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Marina del Rey, CA 90291
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SPECIFICATIONS

GENERAL

FCC Type Accepted	:	For use under the provisions of Part 2, 15 and 83 (shipboard).
Size	:	2-3/4" (H) x 7-1/2" (W) x 10-2/5" (D).
Weight	:	9 pounds.
Supply Voltage	:	13.6V DC Negative Ground ±15%.
Frequency Range	:	Receiver – 156.275 MHz to 162. 550 MHz. Transmitter – 156.025 MHz to 157. 425 MHz.
Channels	:	70 channels, including international channels and 2 WX channels. (All crystals are factory installed.)

TRANSMITTER

Power Output	:	25 watts on "HI" position. 1 watt on "LOW" position.
Output Impedance	:	50 ohms unbalanced.
Frequency Tolerance	:	±0.001% over the range –20°C to +50°C.
Harmonics and Spurious Emission	:	60 dB down or greater.

RECEIVER

Sensitivity	:	0.5 μV or less for –20 dB Quieting.
First I.F.	:	16.9 MHz.
Second I.F.	:	455 kHz.
Frequency Tolerance	:	±0.001% over the range –20°C to +50°C.
Audio Output Power	:	3 watt minimum at 10% distortion (4 ohm load).
Spurious Rejection	:	70 dB or greater.
Modulation Acceptance Bandwidth	:	±7.5 kHz minimum.
Adjacent Channel Selectivity	:	70 dB maximum at ±25 kHz.

INTRODUCTION

CONGRATULATIONS . . .

on your new Ray Jefferson Model "5525" HERCULES. You now own all the radio you'll ever need for world wide VHF communications.

The Model "5525" is an all solid state, compact, VHF/FM marine radio telephone. It provides 70 VHF/FM channels designated for marine use by the International Telecommunications Union.

The unit has been scientifically designed and engineered to operate at maximum efficiency within a marine environment, whether installed aboard a pleasure yacht or commercial vessel. To assure years of trouble free service, the instructions in this manual should be followed precisely.

The Model "5525" is primarily intended for shipboard installation employing nominal 12 volts DC power system. The unit provides communications facilities for the International VHF/FM marine channels. The Model "5525" has 70 channels, transmit and receive, plus 2 weather channels. Furthermore, the Model "5525" includes all international channels. By setting the Function Switch to "INT'L" position, the Model "5525" is set to international channel mode and CG duplex operation. See page 26 of the manual.

Under guidelines established by the International Telecommunications Union, certain channels are set aside as international channels. To receive and transmit on these channels, your set must be in the international channel mode. This is especially important for communications in foreign waters or for communicating with foreign flag shipping. On the Model "5525", channels operating in the international mode are 7, 18, 19, 65, 66, 78, 79, 80 and 88.

Other channels set aside for international operation are 1-5, 21, 23, 60-64, 81-83. Currently, these channels are not authorized for use in U.S. waters; however, they are authorized in international waters.

Your Model "5525" is ready for instant installation. The set is pretuned and designed with special switching circuitry for 70 channel phase-lock-loop operation over

the entire 156-157.5 MHz marine band. Specific crystal frequencies are noted in your Log Book. This book is an important item, and should not be lost. It is needed on board to comply with FCC regulations.

This manual has been prepared with the operator and technician in mind. It should be carefully read prior to installation and before performing any adjustments.

NOTE: TRANSMITTER ADJUSTMENTS ARE ONLY PERMITTED BY AN FCC LICENSED TECHNICIAN HOLDING A FIRST OR SECOND CLASS RADIO-TELEPHONE LICENSE.

A WORD ABOUT LEGAL OPERATION OF YOUR MODEL "5525"

We know you're anxious to install and begin operating your Model "5525". However, before doing so, certain procedures must be followed.

Legal operation of a marine radio telephone requires:

1. A Ship's Station License – available upon application to the Federal Communications Commission, FCC Form 502. (A copy is supplied with the radio.)
2. A Restricted Radio Operator's Permit – available upon application to your local FCC Field Office, with no examination, FCC Form 753A. (A copy is supplied with the radio.)
3. A copy of Part 83 of the Commission Rules, available from the Superintendent of Documents, Washington, D.C. 20402. You are required to read and understand Part 83 prior to operating the radio.
4. Log Book in which you must enter a record of each transmission related to distress traffic.
5. A frequency check by a licensed technician. This information to be entered into the Log Book and signed by the technician. (This has been done at the factory.)

LICENSE APPLICATION INSTRUCTIONS

Formal application for a Ship Station License must be made on FCC Form 502, along with appropriate filing fee.

(**NOTE:** If you already hold a station license for operating a VHF/FM marine radio telephone and are simply replacing your current set with the greater capability of the Model "5525", it is not necessary to apply for a new license or to notify the FCC of any equipment change.)

So that you may legally operate your set while awaiting arrival of your FCC license, the FCC has made provisions for issuance of an interim Ship's Station License. This license will be issued if you or your agent appear in person at the nearest Field Engineering Office of the Commission and submit your completed Form 502, together with your request for the Interim License. The Interim License will allow you to operate your radio telephone for a period of six months from date of issue.

Your Ship Radio Station License will be valid for five years from date of issue. For prompt service and processing by the FCC, Form 502 must be typewritten. Follow the instruction sheet implicity to avoid disappointment and unnecessary delay.

APPLICATION FOR PURCHASE OF RULES

ORDER FORM

TO: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter ..... subscription(s) to Volume IV, containing Parts 81, 83 and 85 of the Federal Communications Commission Rules and Regulations. Make checks or money orders payable to the Superintendent of Documents.

Name_____

Street Address_____

City_____ State_____ Zip Code_____

GETTING TO KNOW YOUR MODEL "5525"

CONTROL FUNCTIONS (FRONT PANEL)

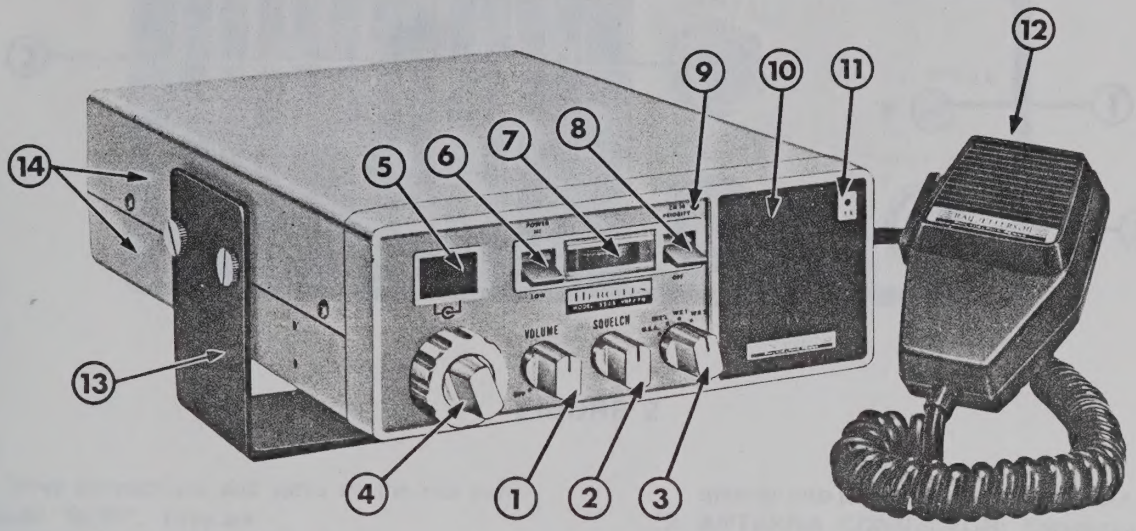

FIGURE 1

Designed for marine use, the Model "5525" permits quick and easy operation. All controls are conveniently located on the front panel. Control functions, switches and features are:

1. **ON-OFF/VOLUME CONTROL:** Applies power to receiver and adjusts desired level of sound.

2. **SQUELCH CONTROL:** When properly set, silences background noise in absence of a received signal.

3. **FUNCTION SWITCH; 4 POSITION:**
   "USA" position sets the radio to USA marine channel mode.
   "INT'L" position sets the radio for International marine channel mode and CG duplex operation.
   "WX1" position selects NOAA weather 1 frequency (162.550 MHz).
   "WX2" position selects NOAA weather 2 frequency (162.400 MHz).

4. **CHANNEL:** Selects desired marine channels. The channel control has an inner and outer knob. To operate, turn the inner knob to select a channel from 1 to 9. To set it to any channels above Channel 9, turn the inner knob to select the last number, and the outer knob to select the first number.

5. **CHANNEL INDICATOR WINDOW:** L.E.D. indicator visually shows channel to which set is tuned.

6. **HI-LOW SWITCH:**
   "LOW" position: transmitter is powered at 1 watt level.
   "HI" position: transmitter is powered at 25 watts level.

7. **ANTENNA OUTPUT & SIGNAL RECEIVE METER:** Shows field strength of the signal being received and relative strength of the output signal.

8. **CHANNEL 16 PRIORITY SWITCH:**
   "CH 16" position: Flip the switch up and the radio is instantly set to Channel 16 on both transmit and receive, regardless of where the channel selector is set. To return to prior channel position, push the switch down to the off position.

9. **CHANNEL 16 PRIORITY LIGHT:** Lights brightly to indicate set is tuned to Channel 16 when priority switch is activated.

10. **SPEAKER:** Front panel speaker, no distortion.

11. **TX INDICATOR LIGHT:** Lights brightly when transmitting.

12. **DYNAMIC MICROPHONE:** Push-to-talk, release to listen. Coiled detachable retractable cord.

13. **UNIVERSAL MOUNTING BRACKET:** Can be mounted on console, bulkhead or overhead.

14. **TWO PIECE CASE:** For easy internal access.

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REAR PANEL CONNECTORS AND EXTERNAL SPEAKER JACK

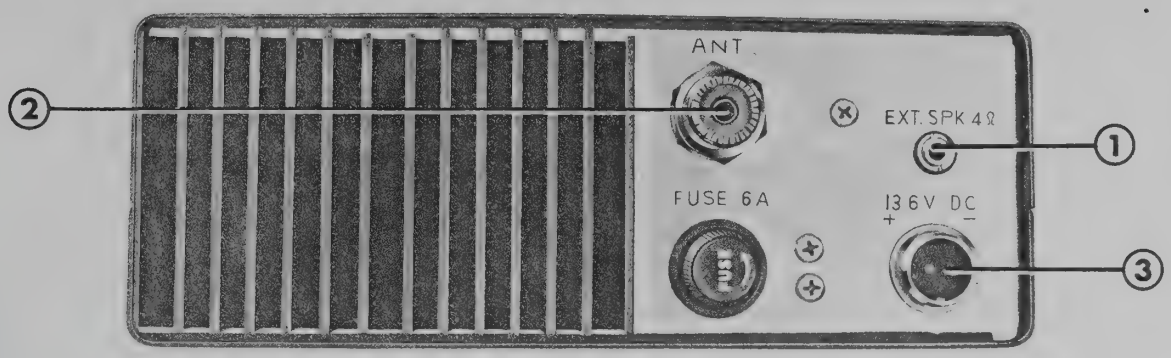


FIGURE 2

There are three connections and jacks on the rear panel of your Model "5525". They are:

1. **EXTERNAL SPEAKER JACK:** The Model "5525" can be used with an external 4 ohm speaker such as the Ray Jeff RS-109. To operate, connect external speaker into jack located on back of set.
2. **ANTENNA CONNECTOR:** Compatible with Ray Jefferson's recommended VHF/FM antennas.
3. **POWER CORD CONNECTOR:** For use with supplied power cord.

INSTALLING YOUR MODEL "5525"

Positioning your Model "5525" is important. Obviously, you want it conveniently located within easy reach and free of interfering objects. At the same time, for top efficiency and protection, you want to shield it from the harmful effects of water and salt spray. The Model "5525" is designed for operation in a marine environment with maximum protection against moisture. However, direct exposure to water or salt spray can be harmful to the equipment.

When installing the Model "5525":

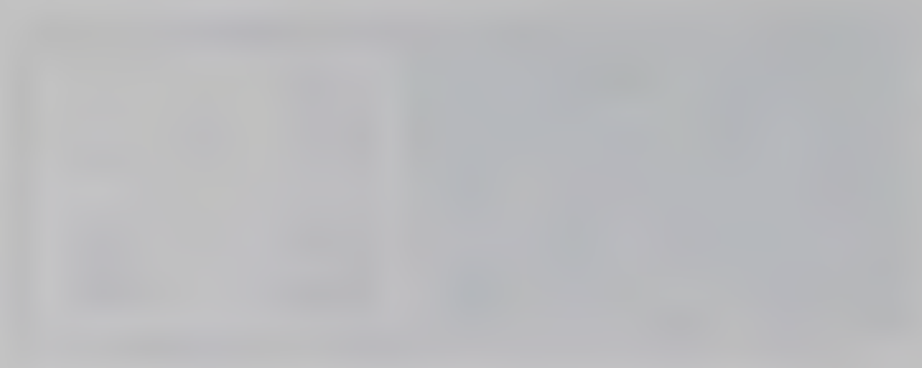
1. Select the driest possible location for installation, maintaining at least a 12-inch clearance from your compass.
2. Decide whether you want an overhead or base mount. The mounting cradle can be installed on either the top or bottom of the radio. To separate the bracket from the radio, unfasten the two side screws.
3. Select the most convenient operating location while observing the precaution in Paragraph 1 above. Leave sufficient space around the radio for adequate ventilation. Fasten the bracket to the area chosen with screws or bolts. Re-install the radio in the bracket.
4. Locate the antenna clear of metal objects and as high as possible, preferably the highest point on the boat. The coaxial feed line should be kept as short as possible consistent with set and antenna location consideration. After installing the antenna, connect the cable to the rear panel antenna connector on the back of the set.

   (**NOTE:** It is suggested you use Ray Jefferson's recommended VHF/FM marine antennas. The Model "5525" has been pre-tuned for operation with these antennas. If any other antenna is used, the services of a licensed radio technician will be required.)

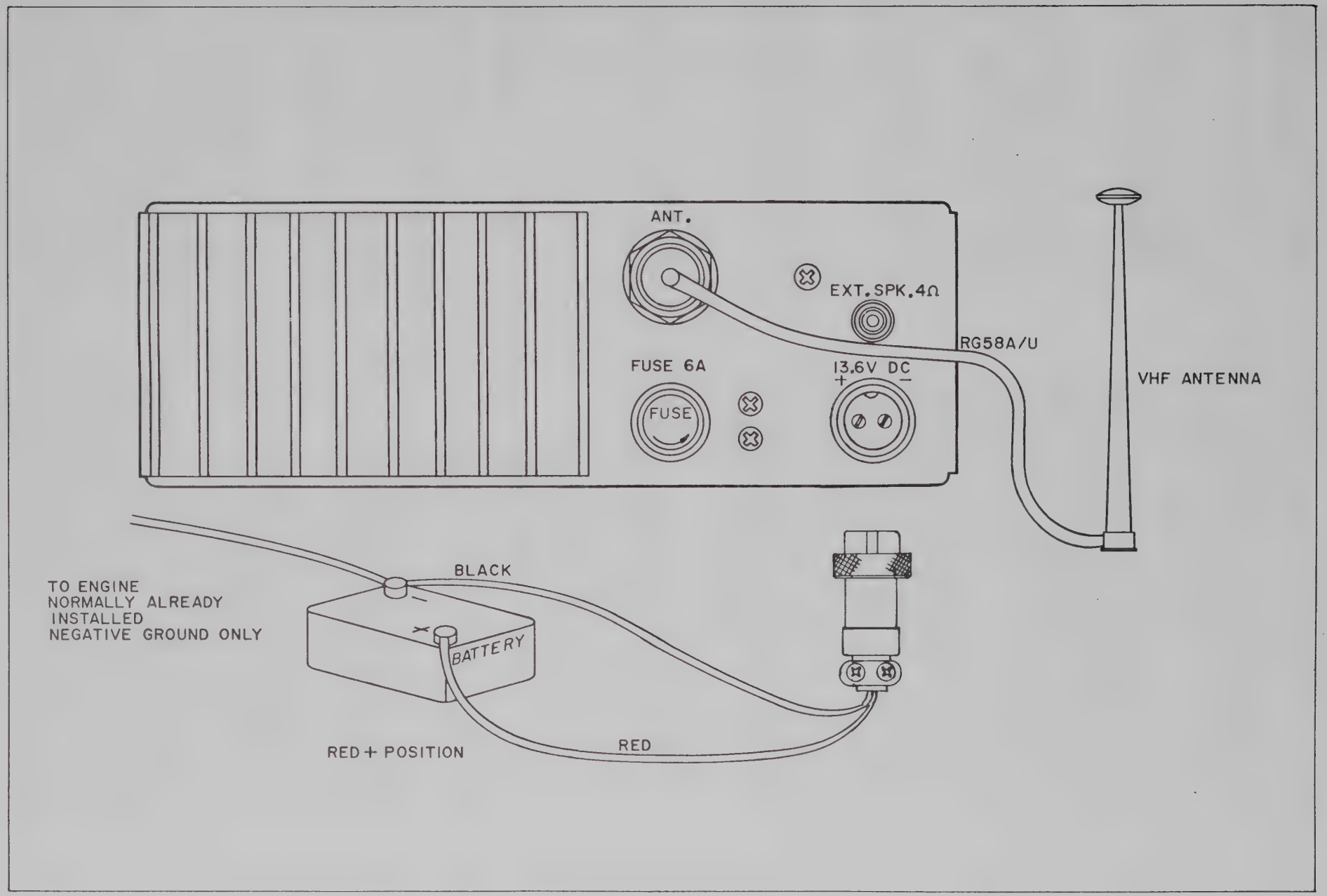
   The recommended Ray Jefferson antennas are:

   FG3 (for sailboats) 3 dB gain; 54"
   FG6 3 dB gain; 54"
   FG9 6 dB gain; 8'
   FG-21 9 dB gain; 21'

   All antennas come complete with required mounting hardware.
5. **POWER CONNECTION:** The Model "5525" is designed to operate from a 12-volt **NEGATIVE GROUND** power source. Do not attempt to use the radio with a positive ground system. Power cable is supplied to make the necessary connections to the boat's battery. It will be necessary to extend the ground wire and the hot wire coming from the power cable connector in order to connect with the storage battery terminals. Use wire no lighter than #12. Connect the ground wire to the negative terminal and the red wire to the positive terminal. The Model "5525" features a safety circuit to prevent transistor burnout. If the unit is incorrectly wired to the power source, a rear panel fuse will blow, protecting the unit from further damage. This fuse is easily replaced with one having the same power rating. (6 amp. 3AG)



INSTALLATION DIAGRAM



OPERATING YOUR MODEL "5525"

Operation of the Model "5525" is simplicity itself.

To Receive:

1. Rotate the VOLUME CONTROL clockwise a few degrees until the switch snaps into the "ON" position. Advance the VOLUME CONTROL to the desired audio level.

2. Place the SQUELCH CONTROL in the fully counter-clockwise position. Advance the SQUELCH CONTROL clockwise until the background noise on an unoccupied channel is reduced to full quieting. Do not advance the control beyond this point.

3. Turn the CHANNEL SELECTOR SWITCH to the desired channel. (In case of WEATHER CHANNEL, turn the FUNCTION SWITCH to the desired channel.)

4. To use the duplex operation of coast guard channels 21, 22, 23 and 83 simply place the function switch in the international position. These channels may be restricted to other than general use.

To Transmit:

The operation of the transmitter and receiver is controlled by the "Push-to-talk" switch located on the side of the microphone. When depressed, the transmitter is placed into operation and the receiver becomes inoperative. When released, the receiver is automatically restored to operation and, at the same time, the transmitter becomes inoperative.

1. Place the "HI-LOW" switch in either the "HI" or "LOW" position dependent on the range of desired communications. In the "HI" position, the set operates at full 25 watt power for maximum output. In the "LOW" position, the set operates at one watt of power. Always use "LOW" power on Channel 13.

2. The Indicator Lamp, located on the upper right corner of the unit, will be "ON" whenever the transmitter is activated. However, it will not turn on when the radio is set to the transmit-prohibited channels, i.e. Channel 15 and NOAA Weather-Receive 1 and 2.

3. Do not use obscene or profane language when transmitting. To do so is a violation of federal law subject to stiff consequences.

NOTE: Do not attempt to transmit unless your antenna is properly connected.

NOISE SUPPRESSION

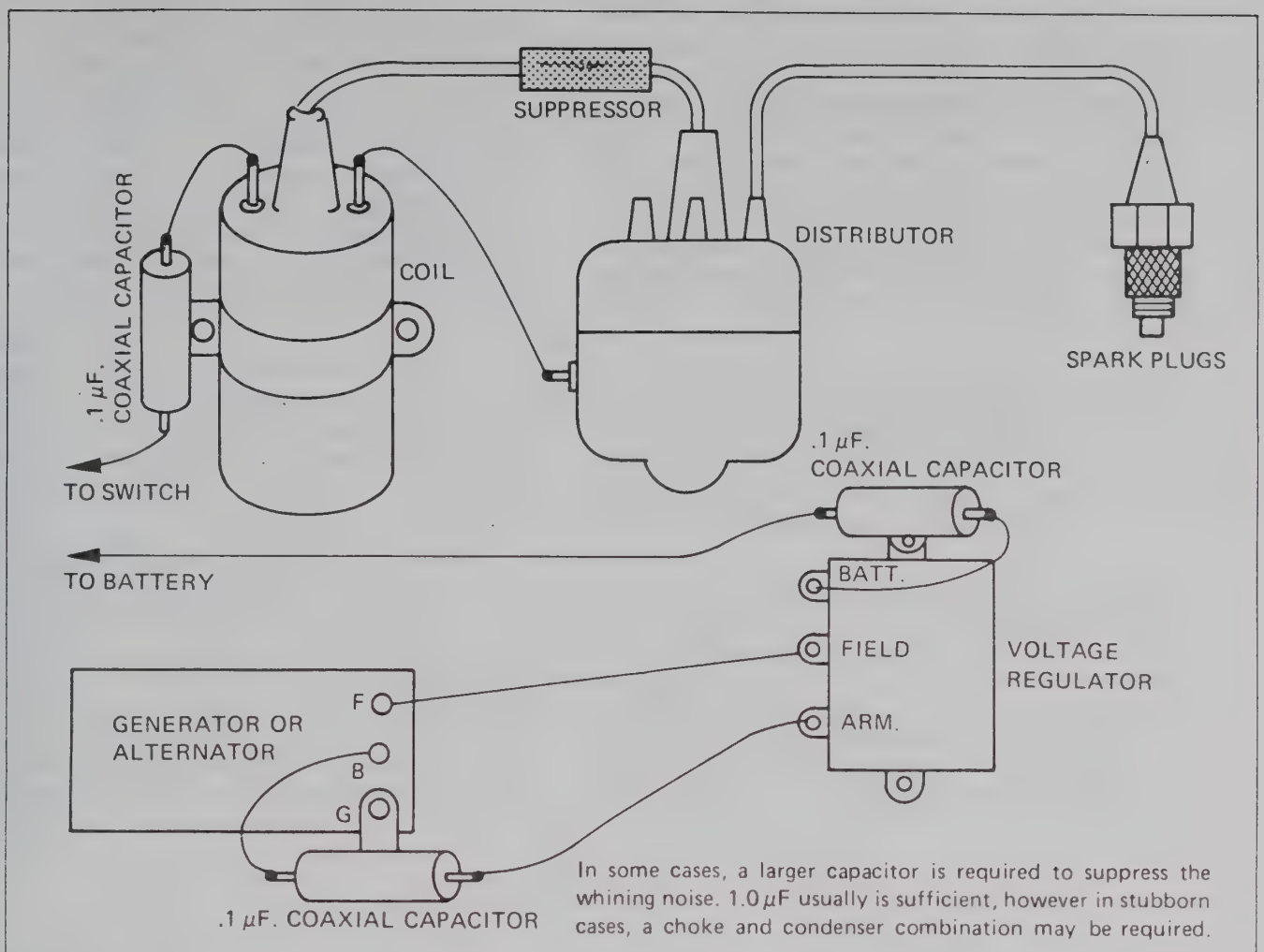
While light ignition noise interference is not as bothersome on VHF/FM as it is on other bands, noise suppression should be done even though it does not seem to be bothersome. Noise pulses chop "holes" in the received signal and weaker stations can be completely blanked out. The following procedure for basic noise elimination will also improve reception on other radios and direction finders and provide better operation of all types of depth sounders.

Spark Plugs: On some makes of engines, Champion "U" type spark plugs (such as UJ6) are specified. We have found that it is impossible to eliminate noise caused by these plugs as they have an extra spark gap near the top of plug which causes the leads to radiate this noise. The remedy is to replace these with resistor type plugs, or, better yet, use standard spark plugs with the new MSW cables. This cable looks like ordinary cable, but instead of a solid or carbonized conductor, it consists of a coiled winding of monel wire over a ferrite core which acts as an RF choke reducing the noise to a very low level. As this wire has a very low resistance compared to the usual suppressors, there is no loss in engine performance. These cables are sold in complete sets packaged for most engines and can be snapped in place in a few minutes.

Ignition Coils: Coils should be mounted on the engine. Clean away paint to insure good ground. Certain coils such as the Mallory plastic encased unit radiate excessive noise and should be replaced with a standard metal case unit.

Voltage Regulators: Older types of regulators contain a vibrating set of contacts to control voltage. If the usual capacitors do not quiet the frying noise, replace with a solid state regulator which has no moving parts.

Tachometers: Some electrical tachometers cause considerable radiation of spark noise. This type of tach connects to the points at the distributor. Disconnect the tach wire at the distributor and note the noise reduction. This lead should be shielded or a special tach filter installed. If Sun tachs are used, all wires must be shielded and the plastic cased sender unit which contains a vibrating set of contacts should be completely shielded in a metal enclosure.



BASIC NOISE SUPPRESSION FOR GASOLINE ENGINES – 150-175 MHz

THEORY OF OPERATION

RECEIVER CIRCUIT

Detailed description of circuit by each block is in order. Refer to the block diagram, and the schematic diagram for the following description of circuits functions and operation.

RF Unit: Signal from antenna connector passes dual-tuned band pass filter, and is amplified by Q101, and fed into FT101 4-section helical resonator. The signal is then mixed with signal from VCO unit by Q102 first mixer, and produces first IF 16.9 MHz.

IF Unit: Signal from RF unit passes FT151 4-section monolythic crystal filter, and is amplified by Q151 first IF AMP., and is mixed with signal from Q153 16.445 MHz second local oscillator, and produces second IF455 kHz. Second IF passes FT152 ceramic filter, and is limited in amplification by IC151 and 152. IF signal is detected by FT153 ceramic discriminator, and fed into AF unit.

AF Unit: AF signal from IF unit is amplified by Q201 and IC201, and drives speaker, while noise signal from IF unit is amplified by IC202 and Q203, and detected by D202 and D203, and drives switching transistor. Q204 controls Q201 AF amplifier and activates squelch.

TRANSMITTER CIRCUIT

TX Driver Stage Unit: Signal from VCO is amplified by Q401 of younger stage unit and fed into Q403 transmit mixer, and through mixing with signal of Q402 16.9 MHz offset oscillator, it produces mixer output 156 MHz band. That signal is then amplified by Q404, Q405 and Q406, and drives final unit.

Final Unit: Output from transmit younger stage unit is amplified by Q451, Q452 and Q453 into 25-watt output, which is supplied into APC unit.

Signal from final unit passes a tiny SWR bridge, diode switching D502 and D503, and also 3-section low pass filter, and produces 25-watt output which is supplied to antenna connector.

PHASE LOCKED LOOP CIRCUIT

Local Unit: Crystals · X251, 252, 253 and 254 are selected by switching transistors Q251 through Q258 and are oscillated by Q259. Oscillation output is multiplied three times by Q260, and again multiplied three times by Q261, and then it is fed into PLL mixer Q262. Simultaneously fed into Q262 is the output of VCO unit, and

PLL IF (5.0 MHz–6.9 MHz) is produced. The PLL IF is amplified by Q304 and 303, and fed into IC304. Signal fed into is divided into half of the frequency by IC 304, and then is program-divided by IC301, and produces the output of 25 kHz. On the other hand, X301 (12.8 MHz) is oscillated by Q306, and fed into IC304 by driver Q305. Here again, signal fed into is divided into half of the frequency by IC304, and fed into IC301, where the output of 1/256 (25 kHz) is produced. These two outputs are fed into IC302 phase detector, and the difference of the two outputs passes IC303, analog switch, and goes into VCO unit. IC303 is controlled by unlock signal from IC302 phase detector.

VCO Unit: The difference output from counter unit passes active low pass filter (Q351 through Q354), and goes into VCO D351, 352 and Q355, and controls VCO frequency. The output of VCO is amplified by Q357, and fed into local unit PLL mixer Q262. On the other hand, the output of VCO is also amplified by Q356, which produces local frequency for both transmit and receive.

Local Unit Crystal Control and Display:

BCD code is selected by channel selector and diode matrix (decoder unit D654 through D670). It is then selected by ROM (Read Only memory IC701 through IC705, Q701, and IC751 through IC755) to perform crystal control, or to disable transmit and display on NO TX channels, as the case may be. The output from diode matrix is decoded by the group of IC651 through IC653, and Q651 through Q653, and D651 through D653, and it drives LED.

POWER SUPPLY CIRCUIT

DC input from power connector is regulated by Q553, Q554, and Q555, and 13.6VDC is selected for transmit and receive. Q551 and Q552 are activated by output from ROM unit which disables transmit, and controls Q553, 554 and 555 which are used to switch the mode of transmit and receive. IC801 is used for 5V regulator for TTL and C-MOS. Q556, Q557 and Q801 regulate final unit as high-low power controller. D551, D552 and Q558 are activated by APC unit, and unlock signal of counter unit, and regulated Q556 to shut down transmit power.

FCC REQUIREMENTS STATE THAT ALL ADJUSTMENTS MADE TO THE TRANSMITTER BE MADE BY A PROPERLY LICENSED AND QUALIFIED TECHNICIAN. THIS INCLUDES INSTALLATION OF TRANSMITTER CRYSTALS AND ANY TUNING THAT IS DONE TO THE TRANSMITTER CIRCUITRY.

PROPER OPERATION OF THE "5525" CALLS FOR A RESONANT 50 OHM ANTENNA. THE INSTALLATION SHOULD BE CHECKED TO SEE THAT THE ANTENNA DOES NOT PRESENT AN APPRECIABLE STANDING WAVE RATIO. IF A HIGH STANDING RATIO EXISTS, CORRECTIVE ACTION MUST BE TAKEN WITH THE ANTENNA. THE TRANSMITTER SHOULD NOT BE RETUNED IN AN ATTEMPT TO CORRECT FOR A FAULTY ANTENNA SYSTEM.

ALIGNMENT PROCEDURES

GENERAL

THE "5525" HAS BEEN FACTORY ALIGNED USING TECHNIQUES AND TEST EQUIPMENT NOT NORMALLY AVAILABLE TO THE SERVICE TECHNICIAN. IT SHOULD NOT BE NECESSARY TO PERFORM ANY ALIGNMENT ON THE UNIT AS RECEIVED FROM THE FACTORY. IN THE EVENT OF COMPONENT FAILURE, ANY REALIGNMENT WILL BE MINIMAL. IF IT APPEARS THAT ANY LARGE DEGREE OF REALIGNMENT IS REQUIRED, THOROUGHLY CHECK THE REPLACEMENT COMPONENT BEFORE PROCEEDING.

PHASE LOCKED LOOP CIRCUIT

1. Equipment Required:

a. 13.6V DC power source (2A)
b. VTVM
c. Oscilloscope
d. Frequency counter.

2. Step-up:

Initial front panel controls should be set in the following manner:

a. Power switch: (Off-volume)	Off
b. Channel selector:	Any channel
c. Squelch control:	Any position
d. Hi-Low power switch:	Either position
e. CH. 16 priority switch: (CH-16-Off)	Off
f. Function switch: (USA-International-WX1-WX2)	USA

3. Procedure:

a. Connect the unit with 13.6V DC power source.
b. Connect TP251 with 10:1 probe of oscilloscope.
c. Do preliminary adjustment of coils L255, 256, 354 and 355 so that the core rises 1.0 mm above the can of coils.

d. Set the trimmer capacitors CT251, 252, 253 and 254 at the position of half capacitance.
e. Apply power to the unit.
f. Set the channel selector to CH65.
g. Adjust L253 and 254 for maximum RF on TP251 and make sure that there is no noticeable difference of RF voltage at the CH65 and WX1.
h. Adjust L353 for 2 volts on TP351 as measured by VTVM.
i. If above adjustment is not possible, adjust L255, 256 and 355 for maximum RF on TP252 and then proceed to above adjustment.
j. Adjust L255, 256 and 355 for maximum RF on TP252, and make sure that there is no noticeable difference of voltage as measured at CH65 and WX1.

Ref.

Frequency of TP252:	CH65 ... 5.25MHz
	WX1 .... 6.95 MHz
Output voltage:	above 0.4 Vp-p'

k. Adjust L353 for 5.5 volts on TP351 by VTVM.
l. Conduct frequency adjustment in the following manner:
   1. Connect frequency counter to the plug of J401.
   2. Measure and adjust frequency on following channels.
      * CH16: f = 139.900 MHz ... CT 252
      * CH77: f = 139.975 MHz ... CT 251
      * CH20: f = 144.700 MHz ... CT 254
      * CH81: f = 144.775 MHz ... CT 253

RECEIVER

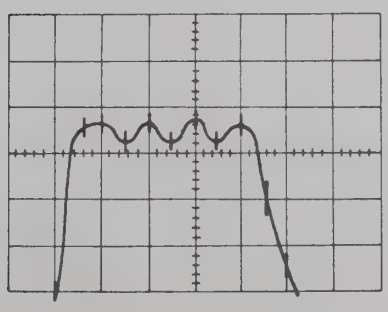
A. RF amplifier section. (RF unit)

1. Equipment required:
a. 13.6V DC power source. (2A)
b. VHF sweep generator and all accessories.

2. Set-up:
Initial front panel controls should be set in the following manner:

a. Power switch: (Off-volume)	Off
b. Squelch control:	Any position
c. Hi-Low power switch:	Either position
d. Channel selector:	Any channel
e. CH16 priority switch:	Either position
f. Function switch: (USA-International-WX1-WX2)	USA

3. Alignment procedure:
a. Apply power to the unit and turn on power switch.
b. Connect the antenna connector of the unit with RF output of sweep generator.
c. Connect can top of Q102 in RF unit with RF input of sweep generator.
d. Adjust L101, 102 and FT101 to obtain a wave form as illustrated below on the following measurement conditions.
   * Input level ..... 10 mVrms.
   * Marker ..... Increment by 1 MHz.
   * Center frequency ..... 160 MHz.
   * Oscilloscope ..... x1 range (max).



B. Intermediate frequency amplifier section. (RF & IF Unit)

1. Equipment required:
a. 13.6V DC Power source. (2A)
b. VTVM with distortion meter.
c. Oscilloscope.
d. Standard signal generator.
e. 4 ohm dummy load.
g. Frequency counter.

2. Set-up:
Initial front panel controls should be set in the following manner:

a. Power switch: (Off-volume)	Off
b. Squelch control:	Fully counterclockwise position
c. Hi-Low power switch:	Either position
d. Channel selector:	Any position
e. CH16 priority switch:	CH16
f. Function switch: (USA-International-WX1-WX2)	USA

3. Alignment procedure:
a. Apply power to the unit and turn on power switch.
b. Connect antenna terminal of the unit with SSG.
c. Connect distortion meter and 4 ohm load in parallel to the output from external speaker terminals.
d. Adjust volume control for 1 Vrms output.
e. Reduce output of SSG to zero, and adjust L103, 151 and 152 for maximum reading on VTVM.
f. Set frequency of SSG to 156.800 MHz and connect DC volt meter between J153 and ground chassis.
g. Adjust L103, 104, 151, 152 and 354 (VCO unit) for maximum reading at DC volt meter. Adjust RT152 for S9 of meter scale at 5 μV of SSG input level.

NOTES: Adjust output level of SSG to prevent saturation of DC volt meter indication.

TRANSMITTER

. Equipment required:

a. 13.6V DC power source. (7A)
b. RF power meter. (30W)
c. Frequency counter. (10 kHz to 200 MHz)
d. VTVM.
e. DC volt meter.
f. Audio oscillator. (1 kHz, 80 mV)
g. FM linear detector.

2. Set-up:

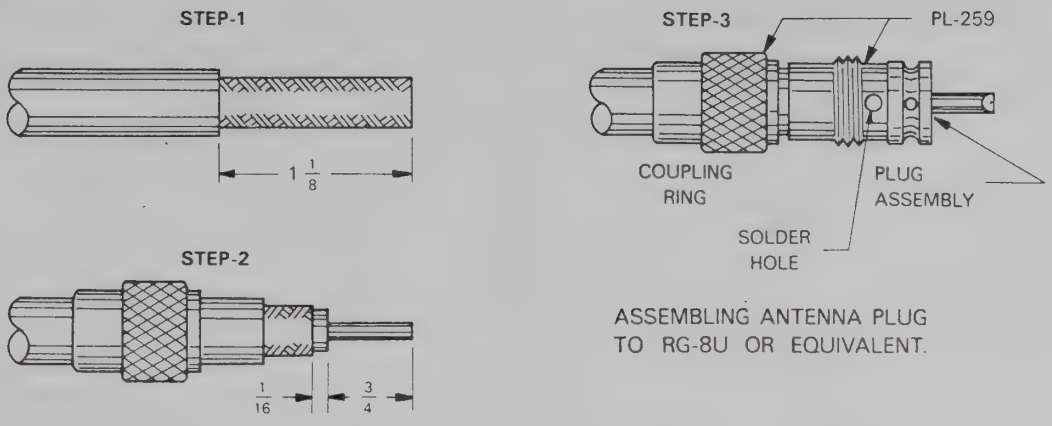
Initial front panel controls should be set in the following manner:

a. Power switch: (Off-volume)	Off
b. Squelch control:	Any position
c. Hi-Low power switch:	Hi position
d. CH Selector:	Any channel
e. CH16 priority switch:	CH16
f. Function switch: (USA-International-WX1-WX2)	USA

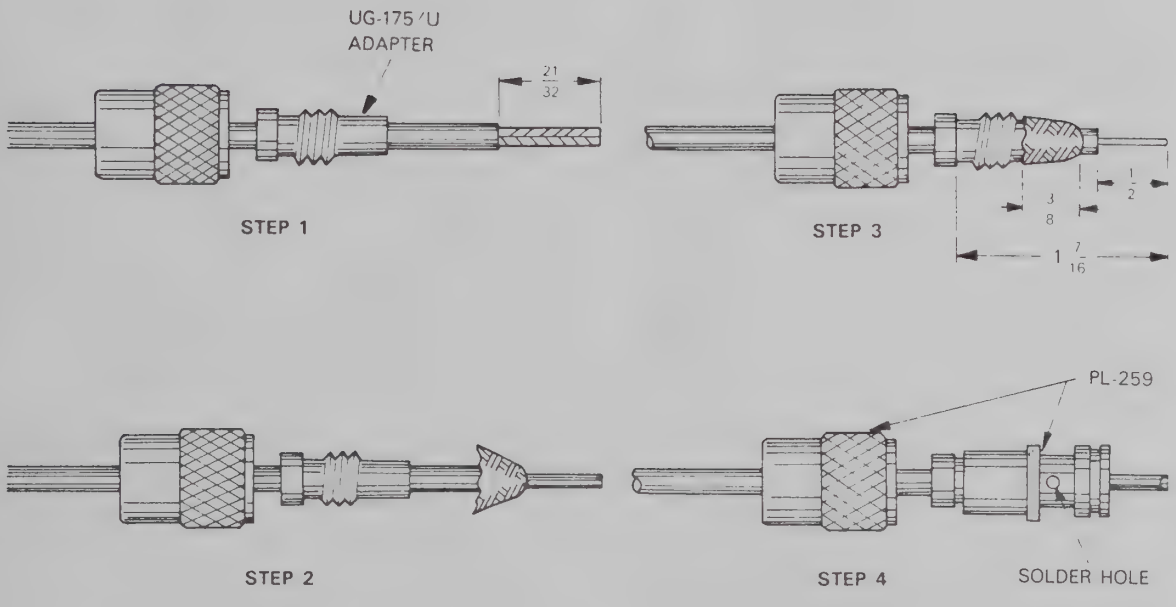
3. Alignment procedure:

a. Connect #1 pin of the microphone connector with audio oscillator, and #2 pin with ground chassis. Connect VTVM in parallel with audio oscillator.
b. Connect TP401 with positive probe of DC volt meter and chassis with negative probe of volt meter.
c. Set trimmer capacitors CT401, 451, 452, 453, 454 and 501 at the position of half capacitance.
d. Adjust L401, 402, 403, 404, 405, 406 and 407 so that the core rises 1 mm above the can.
e. Turn RT551 and 553 fully clockwise.
f. Connect the unit with 13.6V DC power source, and turn on power switch.
g. Connect antenna connector of the unit with RF power meter in parallel to FM linear detector and frequency counter as instructed in its operation manual.
h. Key the transmitter at #3 pin of microphone connector, and adjust L401, 402, 403, 404 and 405 for maximum reading on DC volt meter.
i. Adjust L406, 407, 408, CT451, 452, 453 and 454 for maximum reading on RF power meter.
j. Repeat step h. and i. adjustment several times.
k. Adjust RT553 for 24 watts on RF power meter. And repeat step i. and j.
l. Connect J502 with DC volt meter between ground chassis, adjust RT501 and CT501 for minimum reading on DC volt meter. Repeat step 1. adjustment.
m. Adjust RT553 for 24 watts on RF power meter.
n. Remove RF power meter from antenna connector, and adjust RT551 for 3.0 amperes on 13.6V DC power source meter. This adjustment should be done quickly.
o. Connect RF power meter, and adjust RT351 for 5 kHz on FM linear detector, and adjust CT401 for 156.800 MHz on frequency counter.
p. Set Hi-Low power switch of the unit to Low position, and adjust RT552 for 0.8 watts on RF power meter.
q. Adjust RT502 for the meter reading on the unit to be in the center of the red zone in case of High power position.

COAX CONNECTOR ASSEMBLY DETAIL



ASSEMBLING ANTENNA PLUG
TO RG-8U OR EQUIVALENT.



ASSEMBLING ANTENNA PLUG TO RG-58U
OR OTHER ¼" COAXIAL CABLE

SEMICONDUCTOR VOLTAGE CHART

Note: 1. Data were measured by DC volt-meter 50Kohm/V, ±3%. (Unit = Volt)
2. Unless other wise specified, Data were measured at channel 16.
3. Transmitter inhibit channels are as follow. . CH-15, 75, 76, WX1, WX2.
4. B; Base, E; Emitter, C; Collector, G; Gate, S; Source, D; Drain

Dual Gate MOS-FET

#	Name	G1	G2	S	D	Remarks	
Q101	3SK45-B	1.3	3.2	1.6	9.0		
Q102	do	0.3	0.6	0.4	11.6		
Q151	do	0.7	1.8	1.0	5.8		
Q262	do	0	0	0.3	6.0		
Q356	do	0	3.3	0	6.5		
Q357	do	0	3.3	0.6	7.2		
Q403	do	0	0	0.2	7.1		
Q404	do	0.8	1.9	1.6	7.1		

Bipolar Transistor & J-FET

#	Name	B/G		E/S		C/D		Remarks
Q152	2SC1675-L	1.7		1.2		6.0		
Q153	do	3.0		2.6		6.5		
Q201	2SC945-AQ	1.2	(0)	0.7	(0)	4.6	(13.6)	( ); SQ Max.
			(2.8)		(5.5)		(12.5)	( ); TX
Q203	do	1.1	(0.9)	0.5	(0.6)	5.6	(5.6)	( ); SQ Max.
Q204	do	0	(0.7)	0	(0)	4.7	(0)	do
Q259	2SC1675-L	3.3		2.9		7.1		
Q260	do	2.1		2.4		7.4		
Q261	2SC763-C	1.4		0.8		7.5		
Q263	2SC1675-L	1.6		1.0		5.8		
Q301	2SC945-AQ	0.4		0		2.1		
Q302	2SA733-P	4.5		0		4.8		
Q303	2SC763-C	0.2		0		2.3		
Q304	2SC1675-L	1.5		0.9		2.0		
Q305	2SC763-C	0.1		0		1.8		
Q306	2SC1675-L	1.9		1.8		4.4		
Q351	2SC945-AQ	1.7		1.2		8.0		
Q352	do	1.2		0.7		8.0		
Q353	do	0.7		0		2.8		
Q354	do	2.7		2.1		7.9		
Q355	2SK33-E	0		0.8		7.2		
Q358	2SC945-AQ	3.8		3.3		6.6		
Q401	2SC763-C	2.1		1.5		7.0		
Q402	2SC1675-L	2.0		1.6		6.9		
Q405	2SC763-C	0.8		0.8		12.0		
Q406	2SC1589	0.1		0		11.5		
Q451	2SC1970	−0.6	(−0.6)	0	(0)	12.5	(13.0)	( ); Low-Power
Q452	2SC1972	0	(0)	0	(0)	8.4	(2.6)	do
Q453	2SC1946	0	(0)	0	(0)	7.7	(1.8)	do
Q551	2SC945-AQ	0	(1.2)	0	(0)	12.0	(0)	( ); TX Inhibit CH.
Q552	2SA733-P	12.5	(11.5)	12.7	(11.5)	12.0	(11.5)	( ); TX
Q553	2SB544-E	12.0	(11.5)	12.7	(11.5)	0	(12.0)	do
Q554	2SD400-E	12.7	(0)	12.7	(0)	12.7	(11.5)	do
Q555	2SA733-P	12.0	(11.5)	12.7	(11.5)	12.7	(0)	do
Q651	2SC945-AQ	0.3		0		4.7		
Q652	do	0.3		0		4.7		
Q653	do	0		0		4.7		
Q701	do	0.3		0		4.7		

Bipolar Transistor

#	Name	B	E	C	Remarks
Q556	2SC945-AQ	4.0 1.1 1.7	3.5 0.6 1.1	12.0 12.5 12.2	Normal operating at Hi-Power. Normal operating at Low-Power. Controlled by APC or unlooked signal.
Q557	2SA733-P	11.5 12.0 12.0	12.7 12.5 12.5	9.8 3.3 3.6	Normal operating at Hi-Power. Normal operating at Low-Power. Controlled by APC or unlooked signal.
Q558	2SC945-AQ	0 0 0.6	0 0 0	4.0 1.1 1.6	Normal operating at Hi-Power. Normal operating at Low-Power. Controlled by APC or unlooked signal.
Q801	2SD313-E	9.8 3.3 3.8	9.0 2.6 3.1	12.5 12.5 12.5	Normal operating at Hi-Power. Normal operating at Low-Power. Controlled by APC or unlooked signal.

Measured at channel 08, 68, 26, 86.

#	Name	Pole	CH-08	CH-68	CH-26	CH-86	Remarks
Q251	2SC945-AQ	B E C	0.7 0 0	0.7 0 0	0 0 6.3	0 0 6.3	
Q252	do	B E C	0 0 7.4	0 0 7.4	0.7 0 0	0.7 0 0	
Q253	do	B E C	0.3 0 5.2	0.7 0 0	0.3 0 5.2	0.7 0 0	
Q254	do	B E C	0.7 0 0.1	0 0 5.3	0.7 0 0.1	0 0 5.3	

Each data of CH-26 and CH-86 are equal to CH-08 and CH-68 in transmission.

Linear IC

#	Name	Pin number									
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
IC151	TA7060P	1.4	1.3	0	7.9	7.7	—	—	—	—	—
IC152	TA7061AP	1.8	1.8	5.7	0	7.4	1.7	1.8	—	—	—
IC201	TA7204P	0	6.3	13.6	7.7	1.3	11.5	12.5	6.2	6.2	4.5
IC202	TA7063P	1.4	0.7	0.1	0	0.8	5.4	8.3	—	—	—
IC351	MC78L08CP	13.6	8.0	0	—	—	—	—	—	—	—
IC352	TA7061AP	1.8	1.8	5.0	0	6.0	1.8	1.8	—	—	—
IC801	μPC143G-05	13.6	5.0	0	7.9	—	—	—	—	—	—

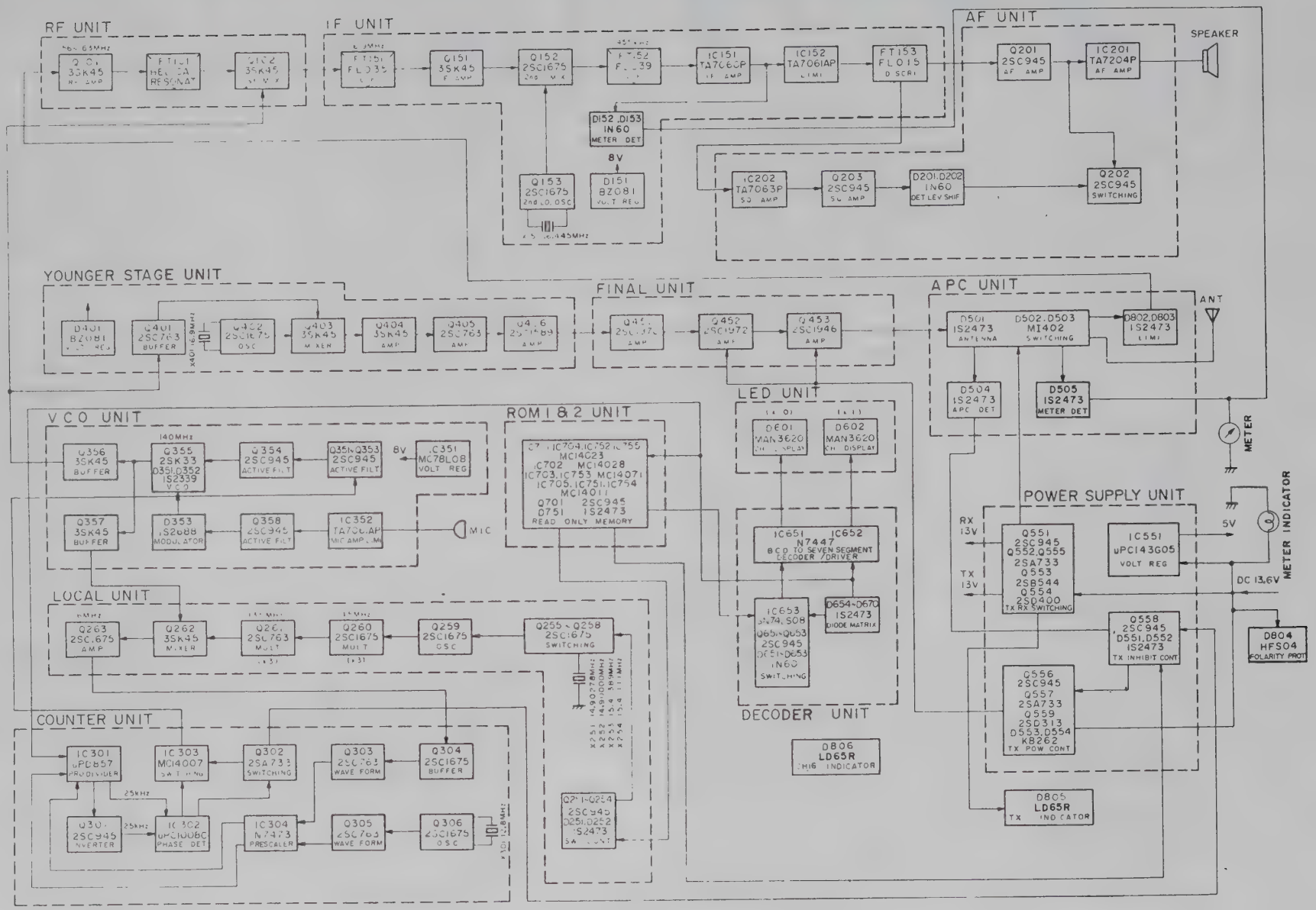
Degital IC

IC302 μPC1008C		IC303 MC14007CP		IC304 N7473A		IC653 SN74LS08N		IC701 MC14023CP		IC703 MC14071CP		IC301 μPC857CW	
Pin		Pin		Pin		Pin		Pin		Pin		Pin	
1	0.1	1	—	1	2.2	1	0.3	1	0.3	1	0	1	0.4
2	4.0	2	—	2	—	2	0.3	2	0.3	2	0	2	3.0
3	2.1	3	0	3	—	3	0.1	3	0.3	3	0	3	3.0
4	4.0	4	1.6	4	4.8	4	0.3	4	4.9	4	4.9	4	0.4
5	4.6	5	1.6	5	1.7	5	0.3	5	0	5	4.9	5	3.0
6	3.6	6	0	6	—	6	0.1	6	4.9	6	0	6	0.2
7	0	7	0	7	0	7	0	7	0	7	0	7	0
8	—	8	4.8	8	—	8	0.3	8	0	8	4.9	8	0
9	—	9	—	9	1.8	9	4.7	9	4.9	9	4.9	9	4.8
10	1.6	10	4.8	10	4.8	10	0.3	10	4.9	10	—	10	0
11	4.1	11	1.6	11	0	11	0.3	11	4.7	11	0	11	0
12	—	12	1.6	12	—	12	4.7	12	0	12	0	12	4.8
13	4.1	13	4.8	13	1.8	13	0.3	13	0.3	13	0	13	0.1
14	4.8	14	4.8	14	—	14	4.9	14	4.9	14	4.9	14	1.9
												15	0
												16	—
												17	—
												18	1.8
												19	—
												20	4.8
												21	1.0
												22	—
												23	0
												24	—

IC704 MC14023CP		IC705 MC14011CP		IC751 MC14011CP		IC752 MC14023CP		IC753 MC14071CP		IC754 MC14011CP	
Pin		Pin		Pin		Pin		Pin		Pin	
1	4.9	1	0	1	4.7	1	0	1	0	1	0.5
2	4.9	2	0.3	2	0	2	4.9	2	0	2	3.9
3	0	3	4.9	3	4.9	3	0	3	0	3	4.9
4	0	4	4.9	4	0	4	4.9	4	0	4	4.9
5	4.7	5	0.3	5	4.9	5	4.9	5	0	5	0
6	4.9	6	4.0	6	4.9	6	4.9	6	0	6	0.3
7	0	7	0	7	0	7	0	7	0	7	0
8	4.9	8	4.9	8	4.9	8	4.7	8	4.9	8	3.9
9	0	9	4.9	9	4.9	9	4.9	9	0	9	4.9
10	4.9	10	0	10	0	10	0	10	4.6	10	0
11	4.0	11	4.9	11	4.9	11	4.9	11	4.9	11	4.9
12	4.9	12	0	12	0	12	4.9	12	0	12	0.5
13	0.3	13	4.0	13	0.5	13	4.9	13	4.1	13	0.5
14	4.9	14	4.9	14	4.9	14	4.9	14	4.9	14	4.9

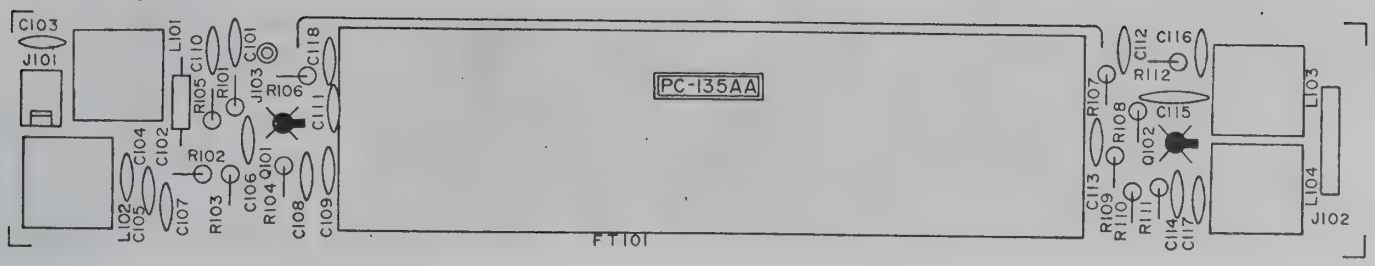
IC755 MC14023CP		IC651 N7447B		IC652 N7447B		IC702 MC14028CP	
Pin		Pin		Pin		Pin	
1	4.9	1	0.4	1	4.0	1	—
2	4.9	2	0.1	2	4.0	2	0
3	0.3	3	4.9	3	4.9	3	0
4	0	4	4.4	4	4.4	4	0
5	0	5	0	5	4.9	5	0
6	4.9	6	0.1	6	0.5	6	0
7	0	7	4.0	7	0.5	7	4.9
8	4.9	8	0	8	0	8	0
9	0	9	3.5	9	0.2	9	0
10	4.9	10	3.5	10	0.3	10	0.5
11	0	11	0.1	11	0.3	11	0.5
12	0	12	0.1	12	3.5	12	4.0
13	4.7	13	3.5	13	3.5	13	4.0
14	4.9	14	3.5	14	0.3	14	0
		15	3.5	15	0.3	15	0
		16	4.9	16	4.9	16	4.9

BLOCK DIAGRAM

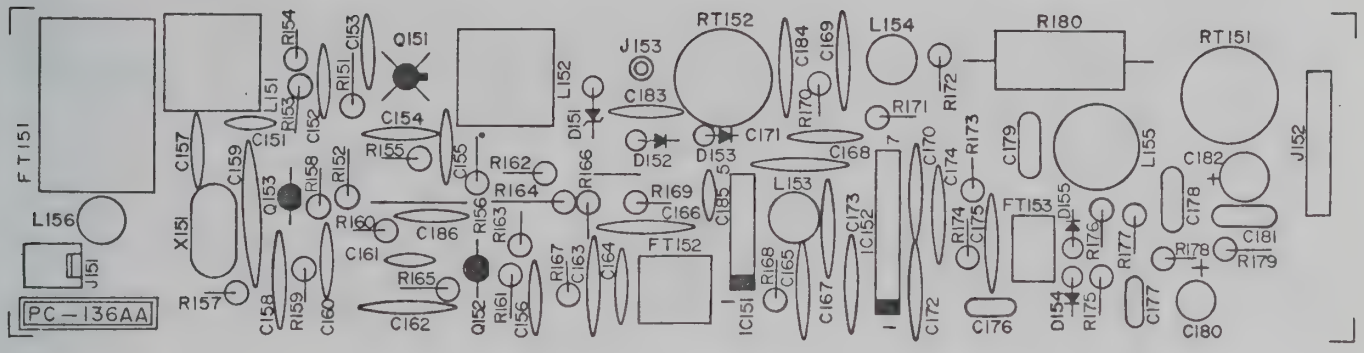


PRINTED CIRCUIT BOARD

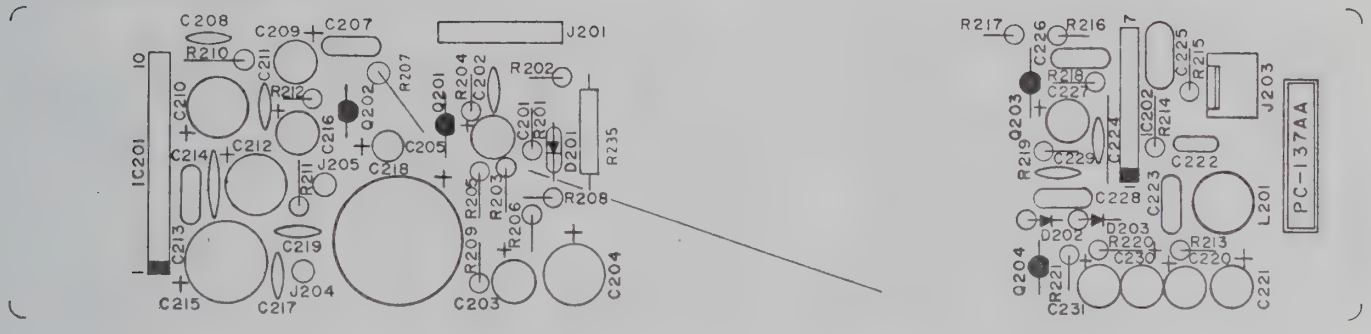
RF Unit (PC-135)



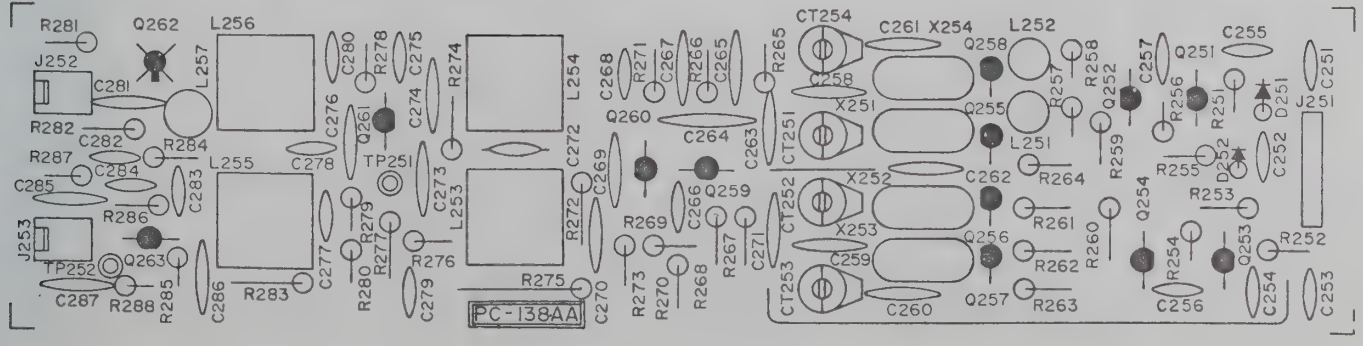
IF Unit (PC-136)



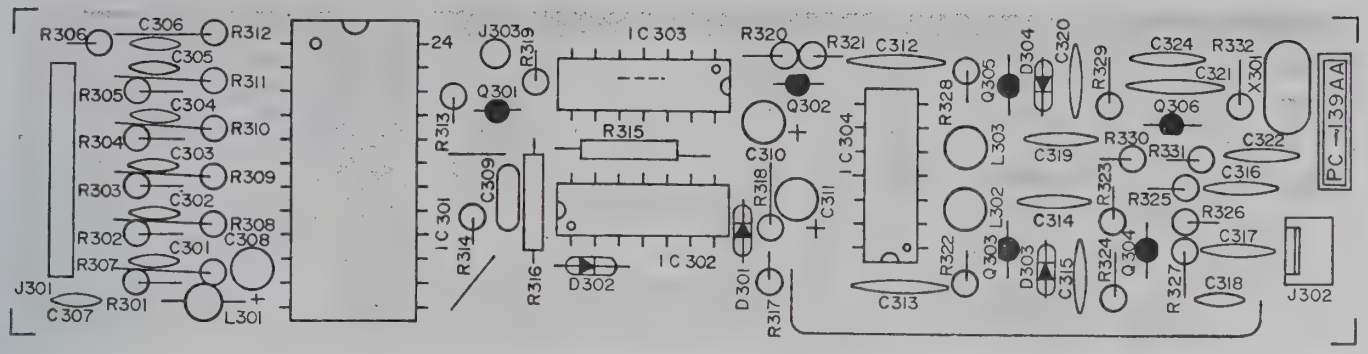
AF Unit (PC-137)



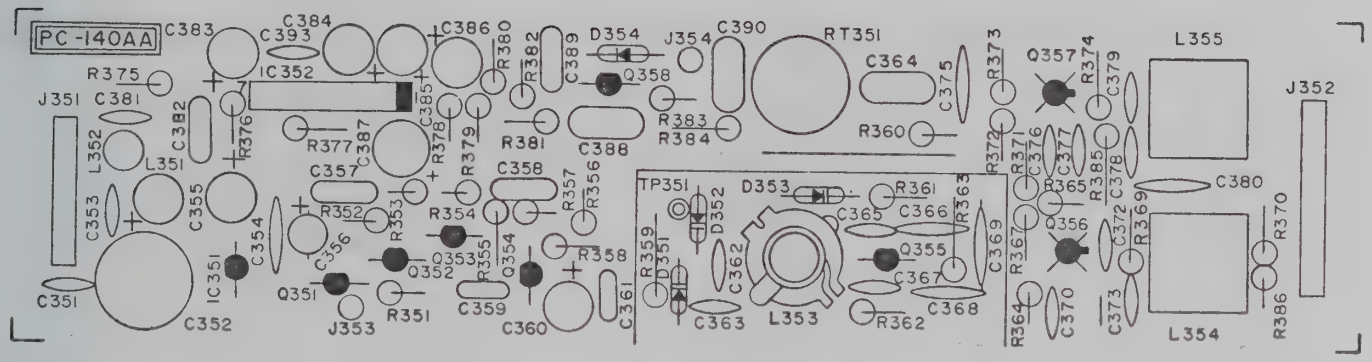
Local Unit (PC-138)



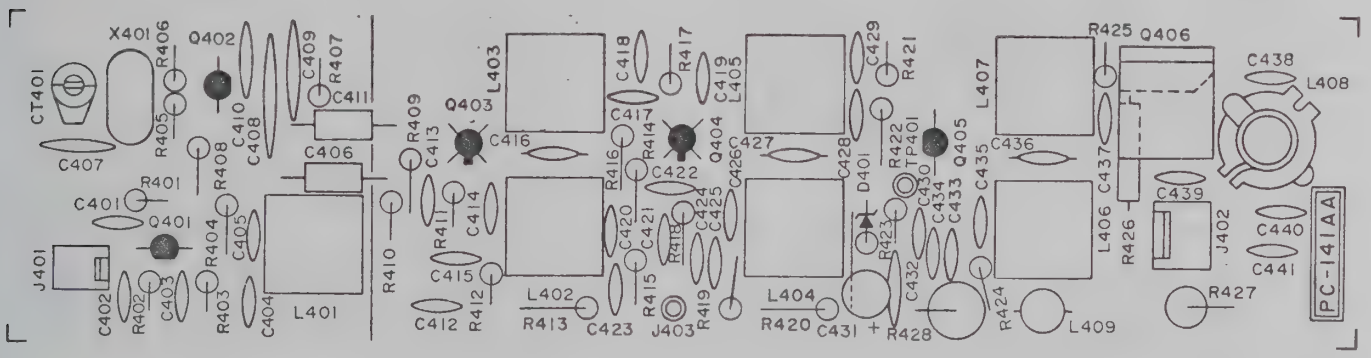
Counter Unit (PC-139)



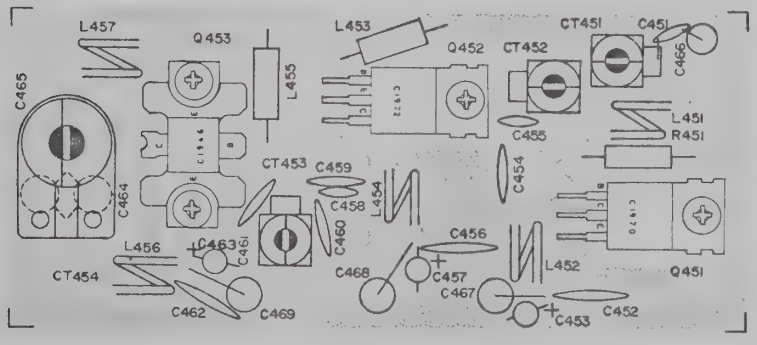
VCO Unit (PC-140)



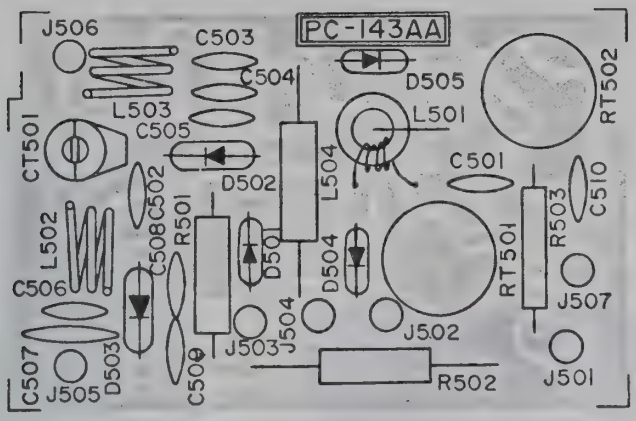
TX Driver Stage Unit (PC-141)



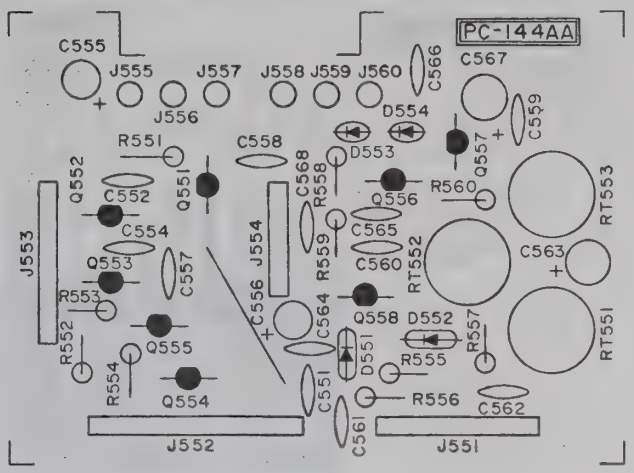
Final Unit (PC-142)



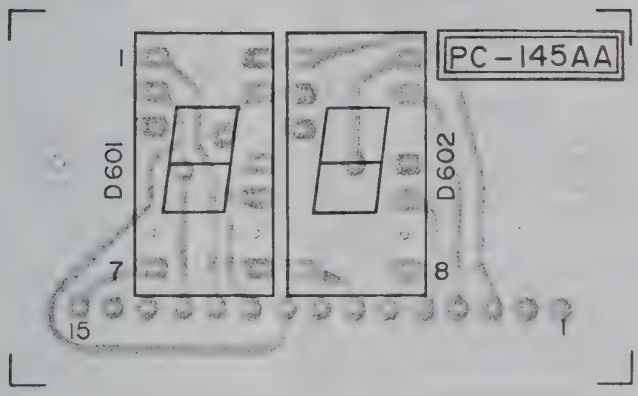
APC Unit (PC-143)



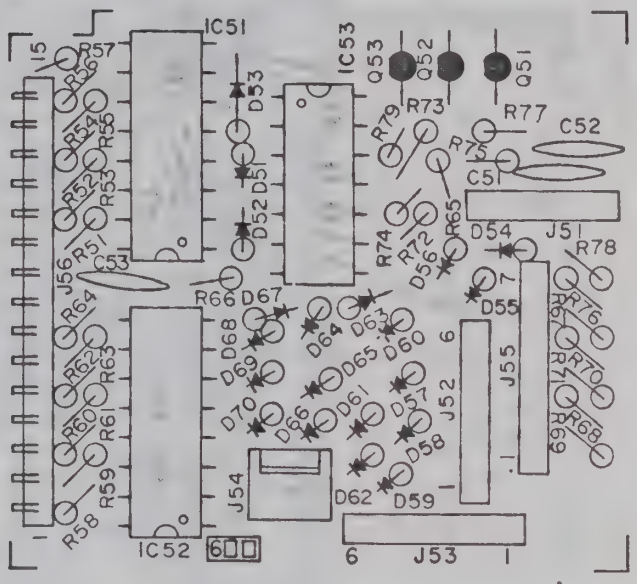
Power Supply Unit (PC-144)



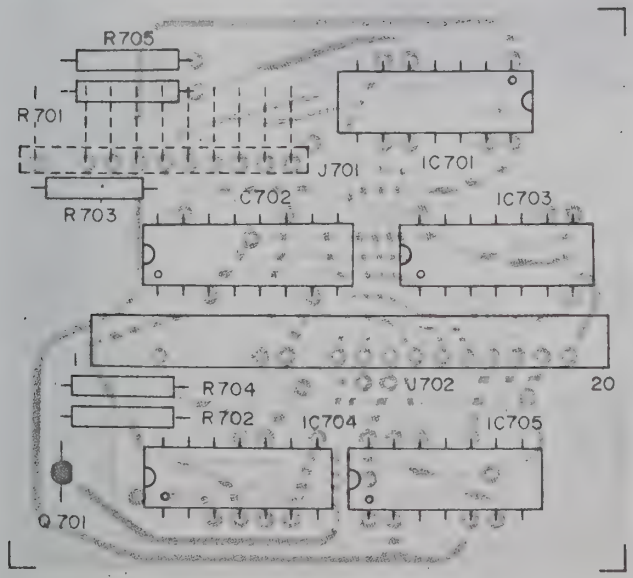
LED Unit (PC-145)



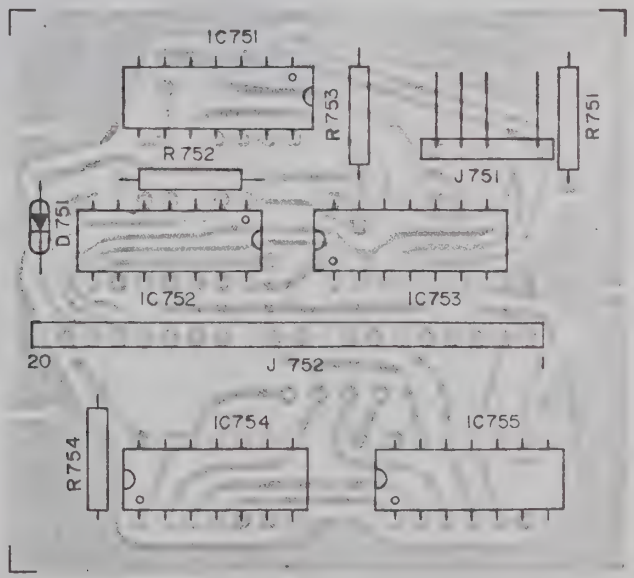
Decoder Unit (PC-146)



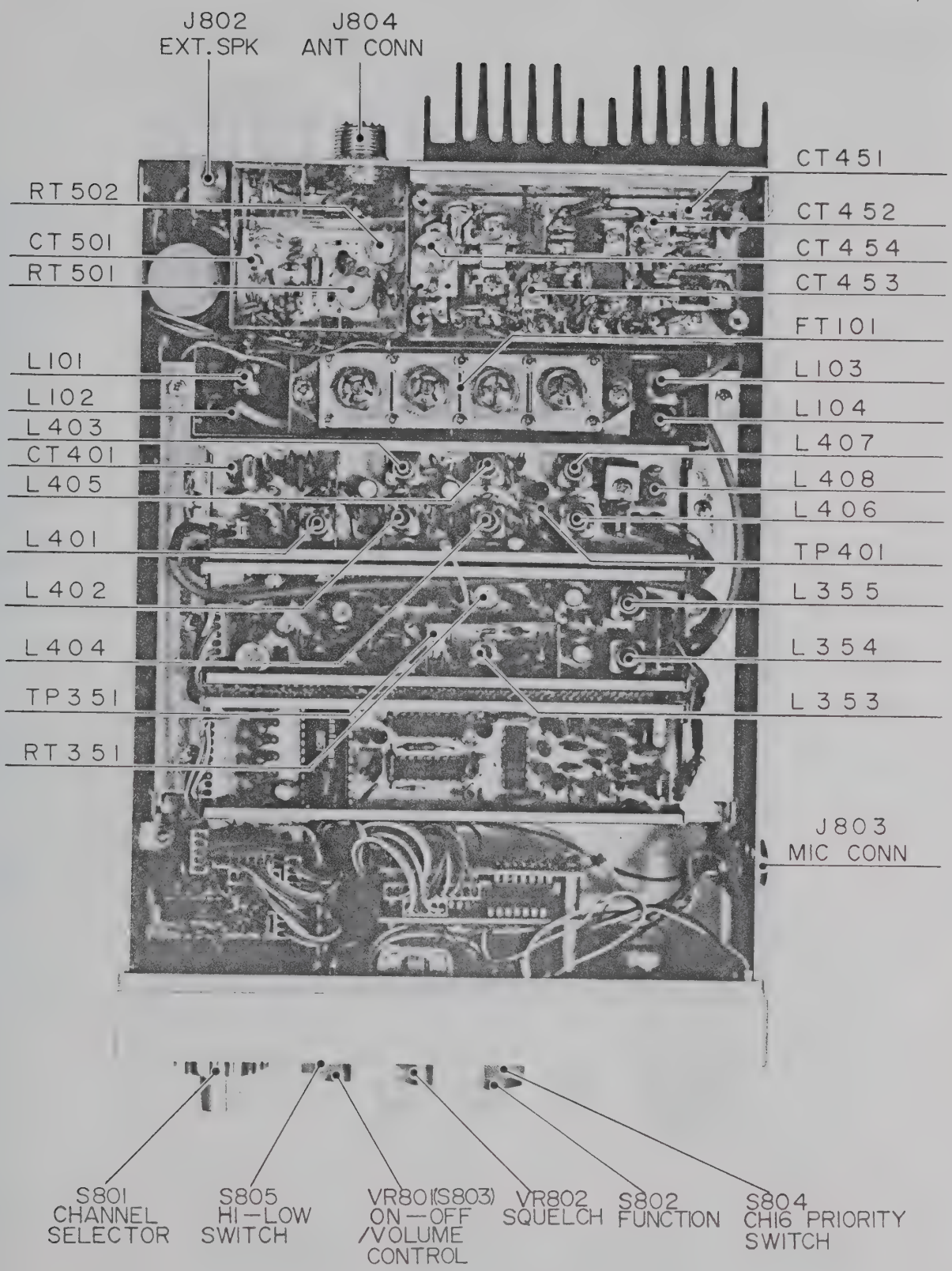
ROM-1 Unit (PC-147)



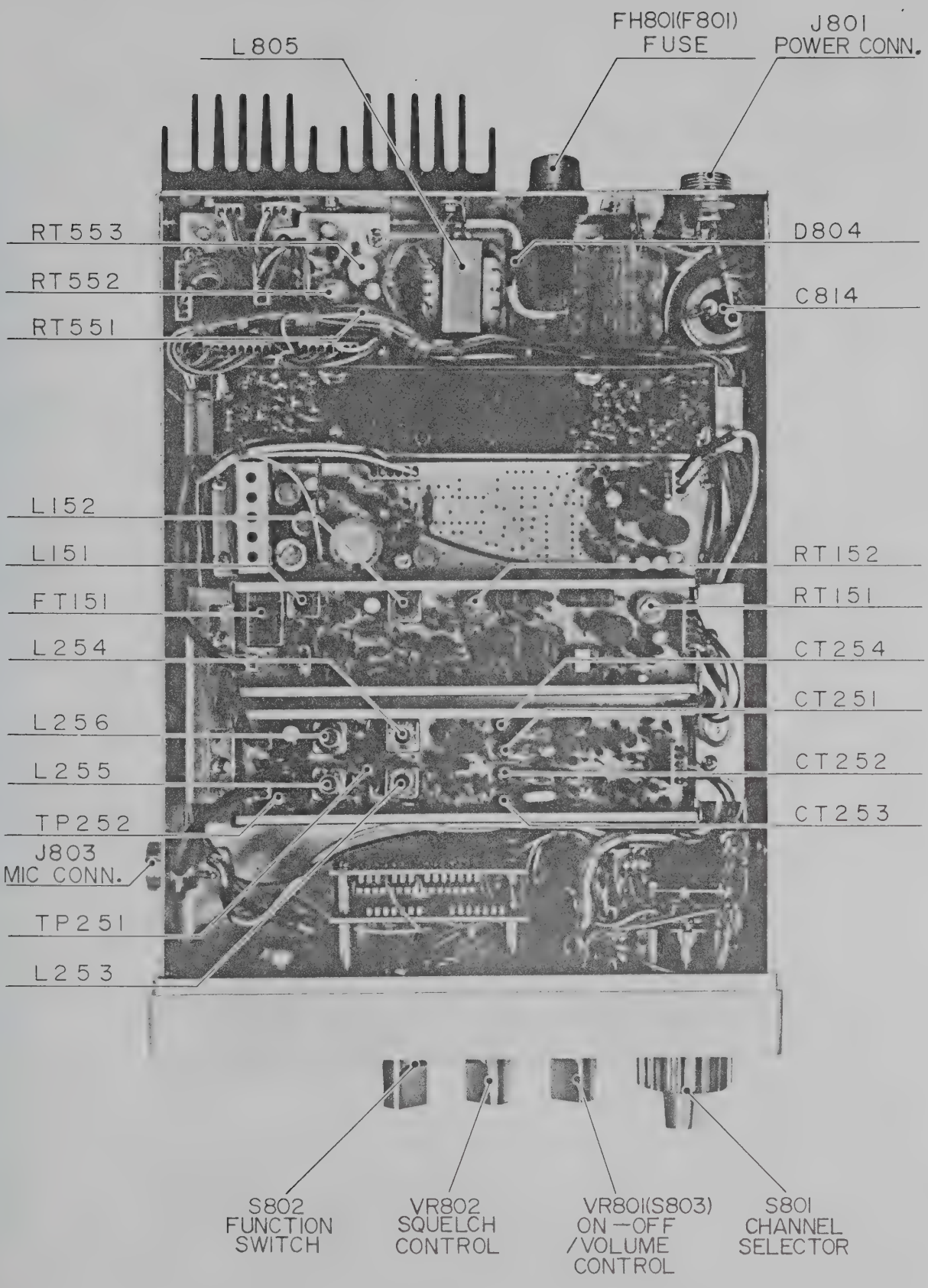
ROM-2 Unit (PC-148)



TOP VIEW

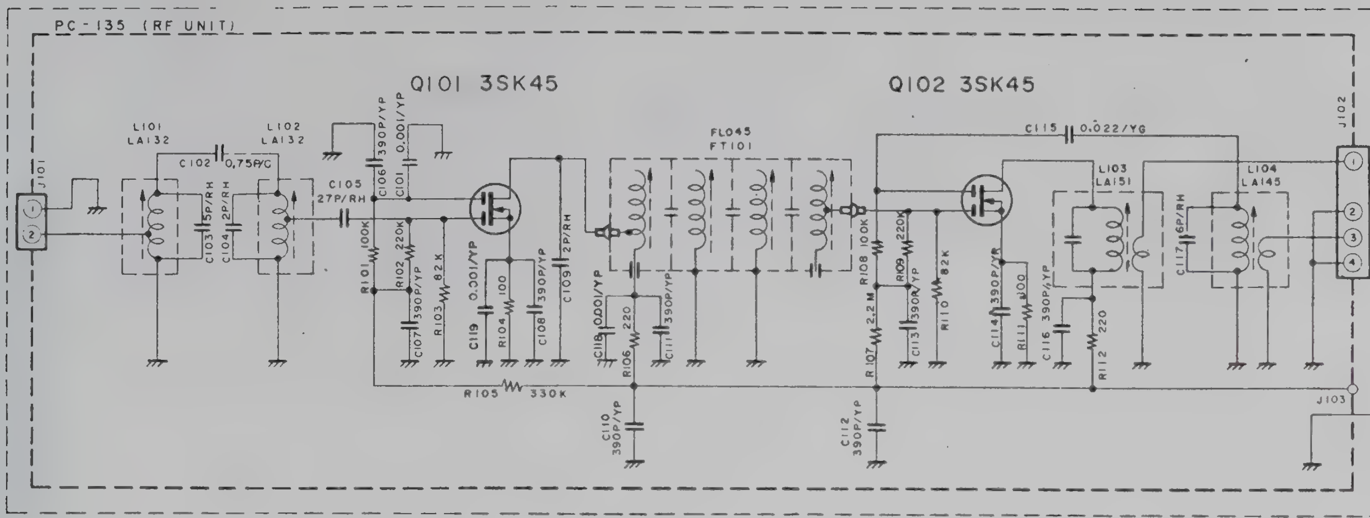

J802
EXT. SPK
J804
ANT CONN
CT451
RT502
CT452
CT501
CT454
RT501
CT453
FT101
L101
L103
L102
L104
L403
L407
CT401
L408
L405
L406
L401
TP401
L402
L355
L404
L354
TP351
L353
RT351
J803
MIC CONN
S801
CHANNEL
SELECTOR
S805
HI—LOW
SWITCH
VR801(S803)
ON—OFF
/VOLUME
CONTROL
VR802
SQUELCH
S802
FUNCTION
S804
CH16 PRIORITY
SWITCH

BOTTOM VIEW


L805
FH801(F801)
FUSE
J801
POWER CONN.
RT553
RT552
RT551
D804
C814
L152
L151
FT151
L254
L256
L255
TP252
J803
MIC CONN.
TP251
L253
RT152
RT151
CT254
CT251
CT252
CT253
S802
FUNCTION
SWITCH
VR802
SQUELCH
CONTROL
VR801(S803)
ON—OFF
/VOLUME
CONTROL
S801
CHANNEL
SELECTOR

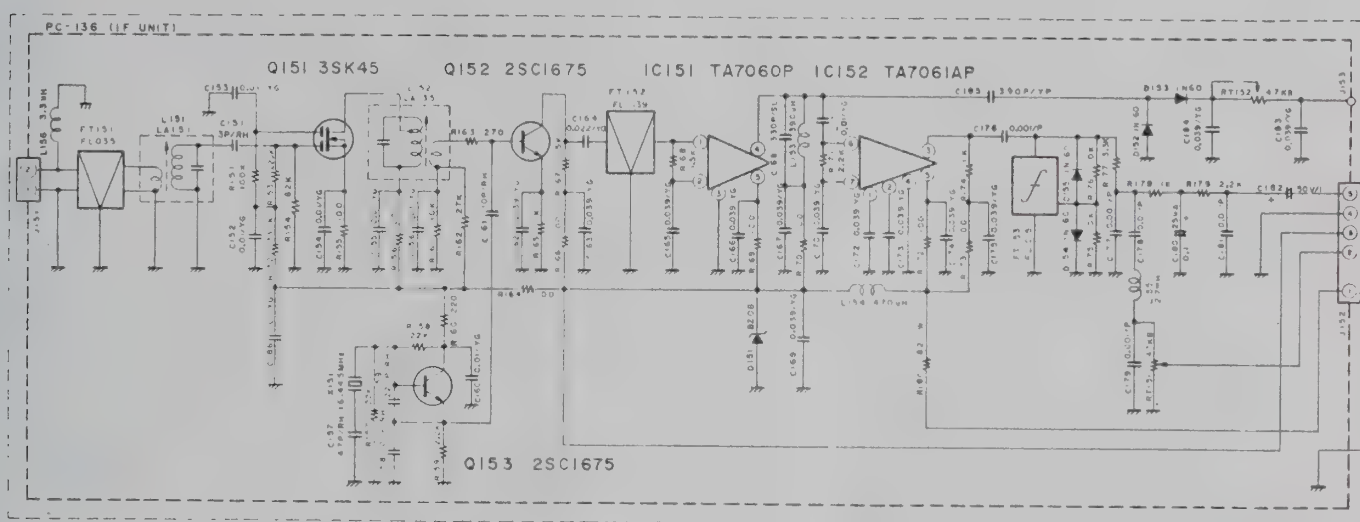
SCHEMATIC DIAGRAM (SEGMENT)

RF Unit (PC-135)



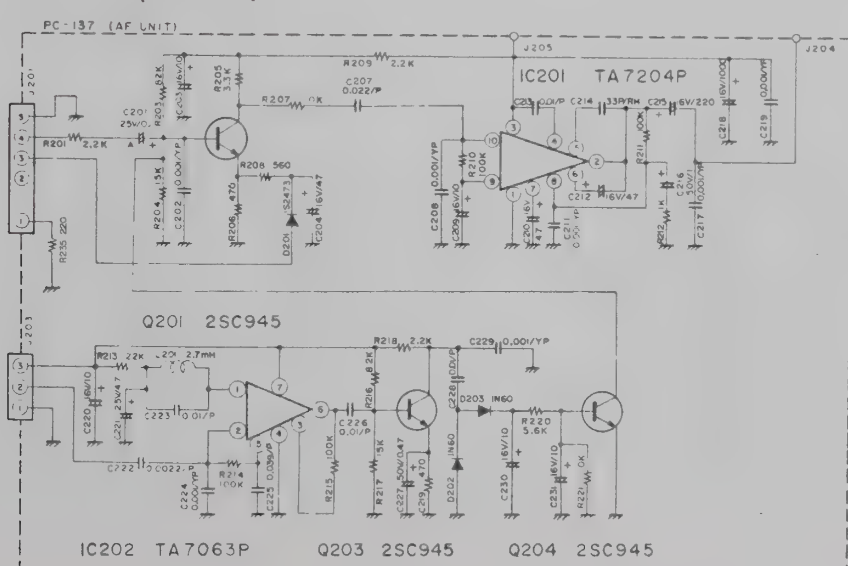
PC-135 (RF UNIT)
Q101 3SK45
Q102 3SK45
J101
L101 LA132
L102 LA132
C102 0.75P/C
C103 5P/RH
C104 2P/RH
C105 27P/RH
C106 390P/YP
C101 0.001/YP
R101 100K
R102 220K
C107 390P/YP
R103 82K
C119 0.001/YP
R104 100
C108 390P/YP
C109 2P/RH
FL045 FT101
C118 0.001/YP
R106 220
C111 390P/YP
R105 330K
C110 390P/YP
R108 100K
R109 220K
R107 2.2M
C113 390P/YP
R110 82K
C112 390P/YP
C114 390P/YP
R111 100
C116 390P/YP
R112 220
C115 0.022/YG
L103 LA151
L104 LA145
C117 6P/RH
J102
J103

IF Unit (PC-136)



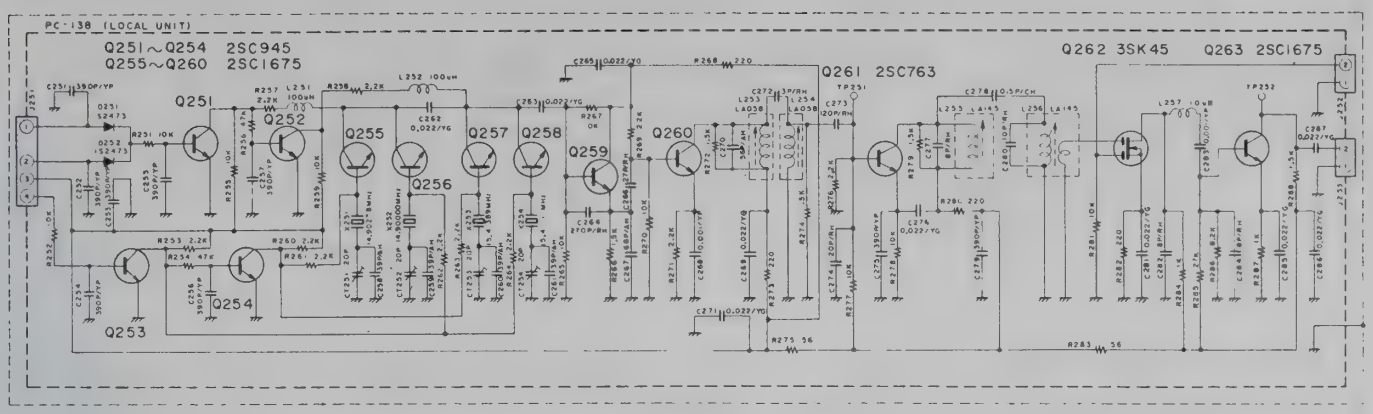
PC-136 (IF UNIT)
Q151 3SK45
Q152 2SC1675
IC151 TA7060P
IC152 TA7061AP
Q153 2SC1675
L156 3.3mH
FT151 FL035
L151 LA151
C151 3P/RH
R151 100K
R154 82K
R163 270
C164 0.022/YG
C185 390P/YP
D153 1N60
RT152 47KB
C176 0.001/P
R178 1K
R179 2.2K
C182 50V/1
L154 470μH
J151
J152
J153

AF Unit (PC-137)

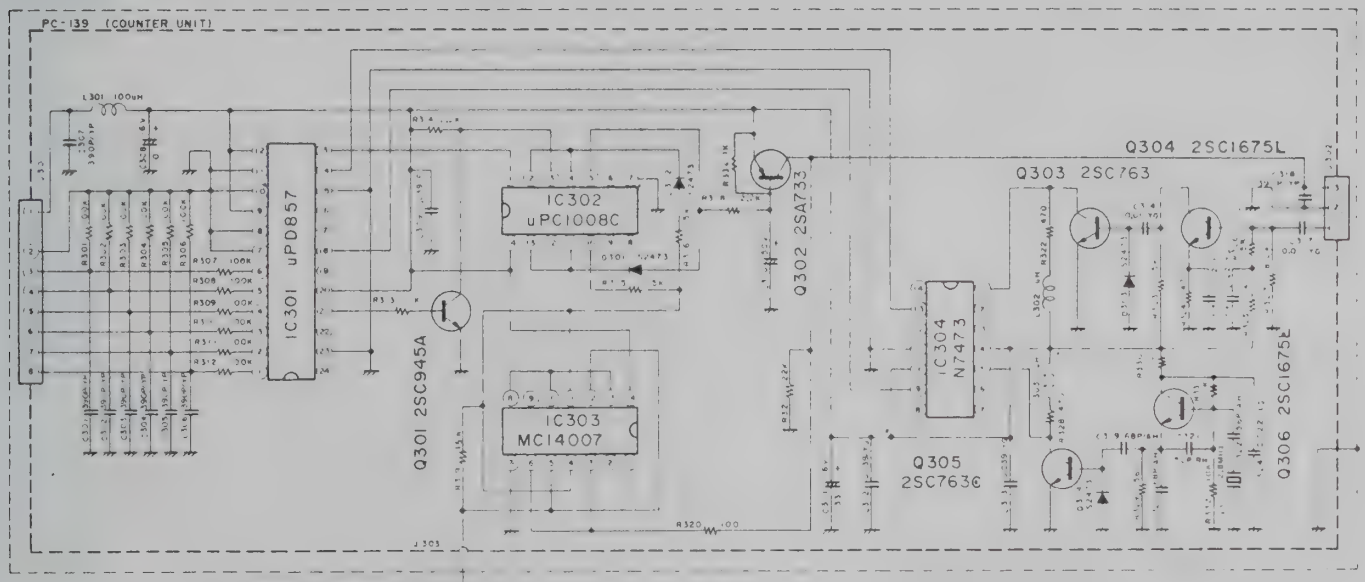


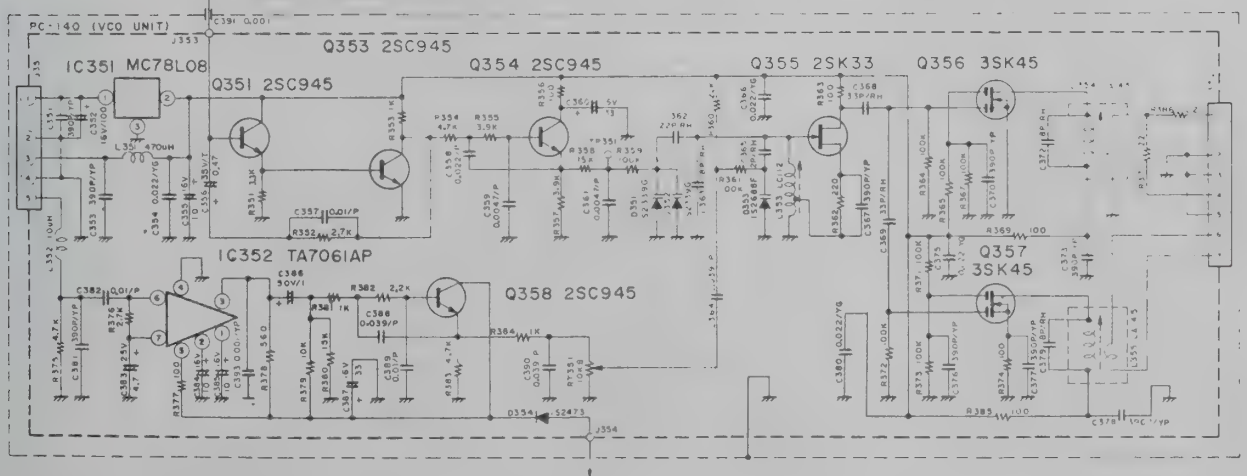
PC-137 (AF UNIT)
J201
J203
J204
J205
R201 2.2K
C201 25V/0.
R203 82K
R204 15K
C202 0.001/YP
R205 3.3K
R206 470
R207
C207 0.022/P
R208 560
D201 1S2473
C204 16V/47
R209 2.2K
R235 220
IC201 TA7204P
C208 0.001/YP
C209 16V/10
R210 100K
C213 0.01/P
C214 33P/RH
C215 16V/220
C212 16V/47
R211 100K
R212 1K
C216 50V/1
C217 0.001/YP
C218 16V/1000
C219 0.001/YP
Q201 2SC945
R213 22K
L201 2.7mH
C220 16V/10
C221 25V/47
C223 0.01/P
C222 0.0022/P
C224 0.001/YP
R214 100K
C225 0.039/P
C226 0.01/P
R215 100K
R216 8.2K
R217 15K
C227 50V/0.47
R218 2.2K
C228 0.01/P
C229 0.001/YP
D203 1N60
D202 1N60
R220 5.6K
C230 16V/10
C231 16V/10
IC202 TA7063P
Q203 2SC945
Q204 2SC945

Local Unit (PC-138)

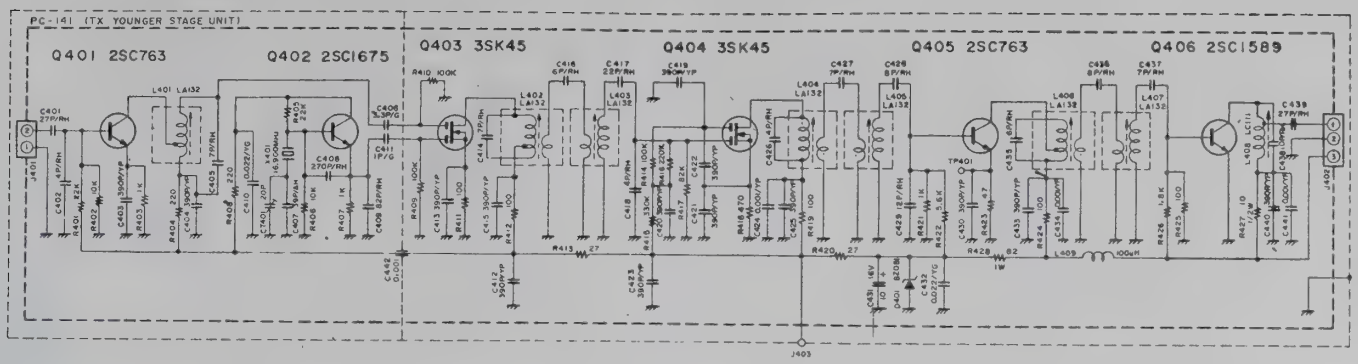


Counter Unit (PC-139) VCO Unit (PC-140)

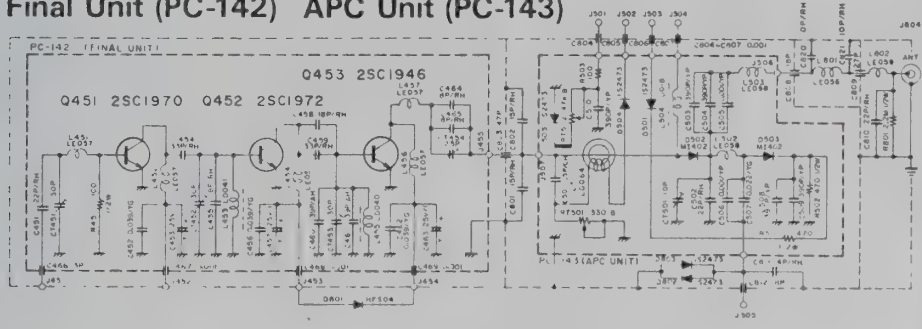




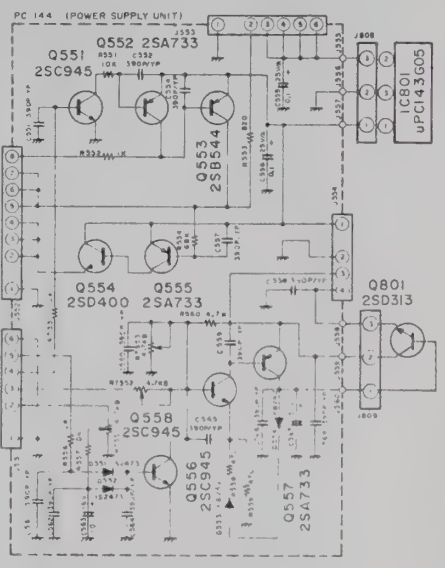
TX Driver Stage Unit (PC-141)



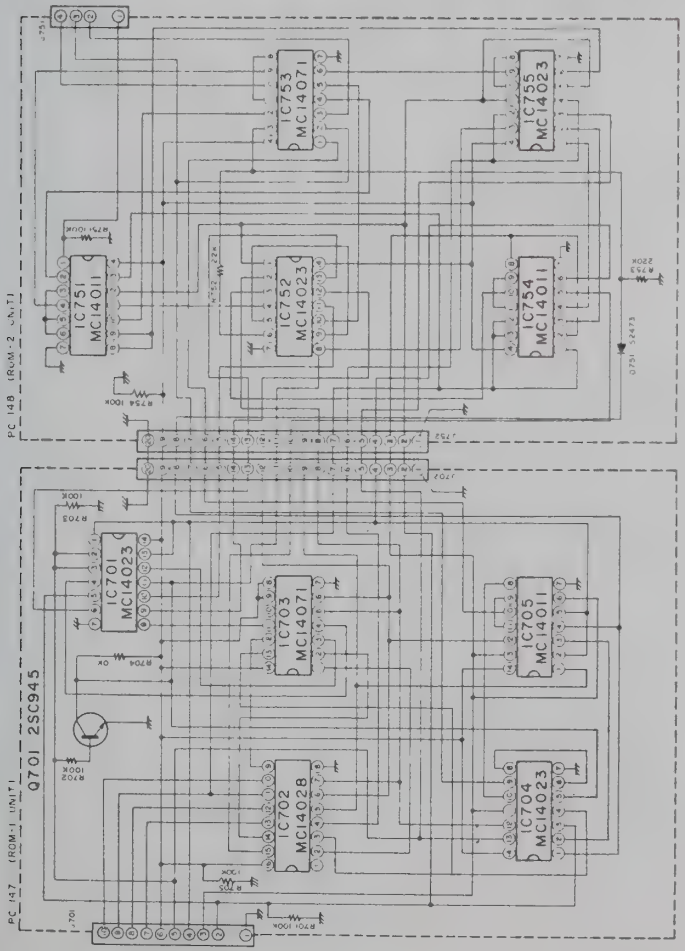
Final Unit (PC-142) APC Unit (PC-143)



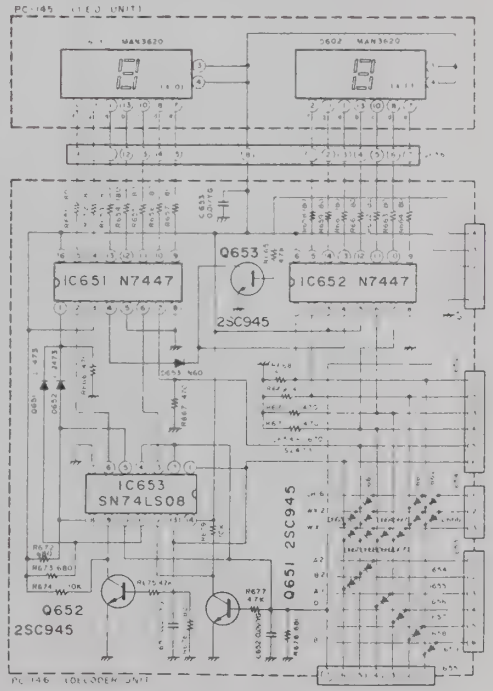
Power Supply Unit (PC-144)



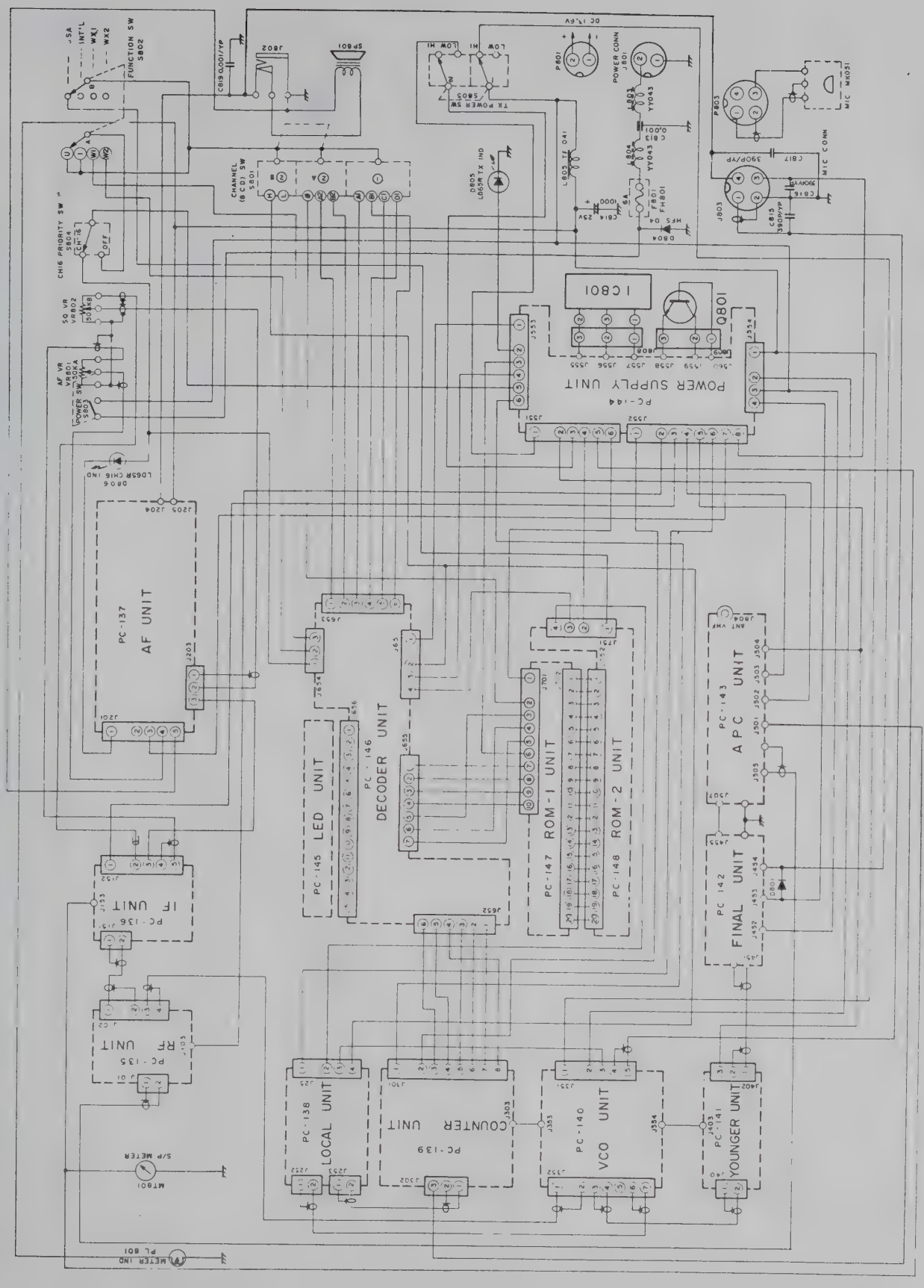
ROM-1 Unit (PC-147) ROM-2 Unit (PC-148)



LED Unit (PC-145) Decoder Unit (PC-146)



SCHEMATIC DIAGRAM (GENERAL)



MODEL 5525 MARINE CHANNELS AND THEIR USAGE

OPERATING CHANNEL DESIGNATIONS	FREQUENCY, (MHz) SHIP TX	COAST TX	TYPE OF TRAFFIC	FUNCTION SHIP/SHIP	SHIP/SHORE
1	156.05	160.65	International Only	–	Yes
2	156.1	160.7	International Only	–	Yes
3	156.15	160.75	International Only	–	Yes
4	156.2	160.8	International Only	–	Yes
5	156.25	160.85	International Only	–	Yes
6	156.3	–	SAFETY	Yes	No
7	156.35	160.95	International Only	–	Yes
7A	156.35	156.35	Commercial	Yes	Yes
8	156.4	–	Commercial	Yes	No
9	156.45	156.45	Commercial	Yes	Yes
9	156.45	156.45	Noncommercial	No	Yes
10	156.5	156.5	Commercial	Yes	Yes
11	156.55	156.55	Commercial	Yes	Yes
12	156.6	156.6	Port Operations, USCG	Yes	Yes
13	156.65	156.65	Locks, Canals, Pilots	Yes	Yes
14	156.7	156.7	Port Operations, USCG	Yes	Yes
15	–	156.75	Environ, Hydrographic	Ship receive only	Ship receive only
16	156.8	156.8	DISTRESS-CALLING	Yes	DISTRESS-CALL
17	156.85	156.85	State Control Restricted	No	Yes
18	156.9	161.5	International Only	Yes	Yes
18A	156.9	156.9	Commercial	Yes	Yes
19	156.95	161.55	International Only	Yes	Yes
19A	156.95	156.95	Commercial	Yes	Yes
20	157.0	161.6	Port Operations	Yes	Yes
21	157.05	161.65	International Only	–	Yes
21CG	157.05	157.05	USCG Restricted	Yes	Yes
22	157.1	161.7	Coast Guard	Yes	Yes
22CG	157.1	157.1	USCG Restricted	Yes	Yes
23	157.15	161.75	International Only	–	Yes
23CG	157.15	157.15	USCG Restricted	Yes	Yes
24	157.2	161.8	Public Corresp.	No	Yes
25	157.25	161.85	Public Corresp.	No	Yes
26	157.3	161.9	Public Corresp.	No	Yes
27	157.35	161.95	Public Corresp.	No	Yes
28	157.4	162.0	Public Corresp.	No	Yes
60	156.025	160.625	International Only	Yes	Yes
61	156.075	160.675	International Only	Yes	Yes
62	156.125	160.725	International Only	Yes	Yes
63	156.175	160.775	International Only	Yes	Yes
64	156.225	160.825	International Only	Yes	Yes
65	156.275	160.875	International Only	Yes	Yes
65A	156.275	156.275	Port Operations	Yes	Yes
66	156.325	160.925	International Only	Yes	Yes
66A	156.325	156.325	Port Operations	Yes	Yes
67	156.375	–	Commercial	Yes	No
68	156.425	156.425	Noncommercial	Yes	Yes
69	156.475	156.475	Noncommercial	No	Yes
70	156.525	–	Noncommercial	Yes	No
71	156.575	156.575	Noncommercial	No	Yes
72	156.625	–	Noncommercial	Yes	No
73	156.675	156.675	Port Operations	Yes	Yes
74	156.725	156.725	Port Operations	Yes	Yes
75	GUARD CHANNEL		–	–	–
76	GUARD CHANNEL		–	–	–
77	156.875		Commercial	Yes	No
78	156.925	161.525	International Only	Yes	Yes
78A	156.925	156.925	Noncommercial	No	Yes
79	156.975	161.575	International Only	Yes	Yes
79A	156.975	156.975	Commercial	Yes	Yes
80	157.025	161.625	International Only	Yes	Yes
80A	157.025	157.025	Commercial	Yes	Yes
81	157.075	161.675	International Only	–	Yes
81A	157.075	157.075	COAST GUARD AUXILIARY		
82	157.125	161.725	International Only	–	Yes
83	157.175	161.775	International Only	–	Yes
83CG	157.175	157.175	USCG, Aux. Only	Yes	Yes
84	157.225	161.825	Public Corresp.	No	Yes
85	157.275	161.875	Public Corresp.	No	Yes
86	157.325	161.925	Public Corresp.	No	Yes
87	157.375	161.975	Public Corresp.	No	Yes
88	157.425	162.025	International and Public Corresp. (Great Lakes Only)	Yes	Yes
88A	157.425		Commercial	Yes	No
WX1	–	162.55	NOAA Weather	Ship receive only	Ship receive only
WX2	–	162.40	NOAA Weather	Ship receive only	Ship receive only

TX = TRANSMIT

*Caution: While it is possible to select channel 75 or 76, the transmitter is disabled on both channels since no communication is authorized on either of these channels.

REPLACEMENT PARTS LIST FOR MODEL 5525

REF. NO.	DESCRIPTION	STOCK NO.
SEMICONDUCTORS		
IC-151	IC TA7060P	DDEY-006001
IC-152, 352	IC TA7061AP	DDEY-004001
IC-201	IC TA7204P	DDEY-010001
IC-202	IC TA7063P	DDEY-008001
IC-301	IC μPD857CW	DDEY-059001
IC-302	IC μPC1008C	DDEY-032001
IC-303	IC MC14007CP	DDEY-052001
IC-304	IC N7473A	DDEY-046001
IC-351	IC MC78L08CP	DDEY-053001
IC-651, 652	IC N7447B	DDEY-023001
IC-653	IC SN74LS08N	DDEY-060001
IC-701, 704, 752, 755	IC MC14023CP	DDEY-049001
IC-702	IC MC14028CP	DDEY-051001
IC-703, 753	IC MC14071CP	DDEY-050001
IC-705, 751, 754	IC MC14011CP	DDEY-048001
IC-801	IC μPC143G05	DDEY-038001
Q-101, 102, 151, 262, 356, 357, 403, 404	FET 3SK45-B	DDCY-104001
Q-152, 153, 255, 256, 257, 258, 259, 260 263, 304, 306, 402	Transistor 2SC1675-L	DDBY-259001
Q-201, 203, 204, 251, 252, 253, 254, 301, 351, 353, 358, 551, 556, 558, 651, 652, 653, 701	Transistor 2SC945-AQ	DDBY-224003
Q-261, 303, 305, 401, 405	Transistor 2SC763-C	DDBY-216001
Q-302, 552, 555, 557	Transistor 2SA733-P	DDBY-003001
Q-354	Transistor 2SC945-AP	DDBY-224006
Q-355	FET 2SK33-E	DDCY-005001
Q-406	Transistor 2SC1589-3L	DDBY-235001
Q-451	Transistor 2SC1970	DDBY-268001
Q-452	Transistor 2SC1972	DDBY-267001
Q-453	Transistor 2SC1946	DDBY-266001
Q-553	Transistor 2SB544-E	DDBY-103003
Q-554	Transistor 2SD400-E	DDBY-408003
Q-801	Transistor 2SD313-E	DDBY-407004
DIODES		
D-151, 401	Zener Diode BZ-081	DDAY-009004
D-152, 153, 154, 155, 202, 203,	Diode IN60P	DDAY-001006
D-201, 251, 252, 301, 302, 303, 304, 354, 501, 504, 505, 551, 552, 651, 652, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 751, 802, 803	Diode IS2473	DDAY-048001
D-351, 352	Varicap IS2339-G	DDAY-030001
D-353	Varicap IS2688-F	DDAY-006004
D-502, 503	Diode MI402	DDAY-059001
D-553, 554	Varistor KB-262	DDFY-004002
D-601, 602	Diode 5082-7730	DDAY-065003
D-653	Diode IN60P	DDAY-001004
D-801, 804	Diode HiFi Special (HFS04)	DDAY-011001
D-805, 806	Diode LD-65R	DDAY-057001
CAPACITORS		
C-106, 107, 108, 110, 111, 112, 113, 114, 116, 185, 251, 252, 253, 254, 255, 256, 257, 275, 279, 301, 302, 303, 304, 305, 306, 307, 318, 351, 353, 367, 370, 373, 376, 377, 378, 381, 403, 404, 412, 413, 415, 419, 420, 421, 422, 423, 425, 430, 433, 440, 503, 504, 508, 509, 510, 551, 552, 554, 557, 558, 559, 560, 561, 562, 564, 565, 566, 568, 815, 816	Ceramic 390P 50V KYP	CKBB-813915
C-102	Minic ECG-N51R5K 1.5P 500VK	CBAA-821595
C-103, 117, 435	Ceramic 6P 50VD RH	CCRB-816092
C-104, 402, 426, 438, 811	Ceramic 4P 50VC RH	CCRB-814091
C-105, 266, 401, 439	Ceramic 27P 50VJ RH	CCRB-812704
C-109, 365, 418, 429	Ceramic 2P 50VC RH	CCRB-812091
C-115, 164, 262, 263, 265, 269, 271, 276, 281, 285, 286, 287, 315, 316, 324, 354, 366, 375, 380, 410, 432, 507, 558	Ceramic 0.022μ 25VZ YG	CKFB-812230
C-101, 118, 119, 202, 208, 211, 217, 219, 224, 229, 268, 283, 393, 424, 434, 441, 505, 506, 819	Ceramic 0.001μ 50VK YP	CKBB-811025
C-151	Ceramic 1P 50VC CH	CCCB-811091
C-152, 153, 154, 155, 156, 160, 171, 186, 314, 317, 651, 652, 653	Ceramic 0.01μ 25VZ YG	CKFB-811030
C-157	Ceramic 47P 50VJ RH	CCRB-814704
C-158	Ceramic 100P 50VJ RH	CCRB-811014
C-159	Ceramic 220P 50VJ RH	CCRB-812214
C-161, 280, 436	Ceramic 10P 50VJ RH	CCRB-811004
C-162, 163, 165, 166, 167, 169, 170, 172, 173, 174, 175, 183, 184, 312, 313, 452, 456, 462	Ceramic 0.039μ 25VZ YG	CKFB-813930
C-168	Ceramic 330P 50VJ SL	CCGB-813314
C-176, 177, 179	Mylar 0.001μ 50VK	CQMR-811025
C-178, 181, 213, 223, 226, 228, 357, 382, 389	Mylar 0.01μ 50VK	CQMR-811035
C-180, 201, 555, 556	Aluminium 0.1μ 25VM	CAAH-511086
C-182, 216, 310, 386 567	Electrolytic 1μ 50V	CELF-811090
C-207, 358	Mylar 0.022μ 50VK	CQMR-812235
C-203, 209, 220, 230, 231, 308, 355, 384, 385, 431, 563	Electrolytic 10μ 16V	CELF-311000
C-204, 210, 212	Electrolytic 47μ 16V	CELF-314700
C-214, 368, 369, 454, 459	Ceramic 33P 50VJ RH	CCRB-813304
C-215	Electrolytic 220μ 16V	CELF-312210
C-218	Electrolytic 1000μ 16V	CELF-311020
C-221, 383	Electrolytic 4.7μ 25V	CELF-514790
C-222	Mylar 0.0022μ 50VK	CQMR-812225
C-225, 309, 364, 388, 390	Mylar 0.039μ 50VK	CQMR-813936
C-227	Electrolytic 0.47μ 50V	CELF-814780
C-258, 259, 260, 261, 407, 460, 461	Ceramic 39P 50VJ AH	CCAB-813904
C-264, 408	Ceramic 270P 50VJ RH	CCRB-812714
C-267, 319, 320	Ceramic 68P 50VJ AH	CCAB-816804
C-270, 322	Ceramic 56P 50VJ AH	CCAB-815604
C-272	Ceramic 3P 50VC RH	CCRB-813091
C-273, 274	Ceramic 120P 50VJ RH	CCRB-811214
C-277, 282, 284, 372, 379, 427, 464, 465	Ceramic 8P 50VD RH	CCRB-818092
C-278	Ceramic 0.5P 50VC CH	CCCB-815081
C-311, 360, 387	Electrolytic 33μ 16V	CELF-313300
C-321	Ceramic 150P 50VJ RH	CCRB-811514
C-352	Electrolytic 100μ 16V	CELF-311010
C-356	Tantalum 0.47μ 35V	CSEA-664780
C-359, 361	Mylar 0.0047μ 50VK	CQMR-814725
C-362, 417, 451, 502, 810	Ceramic 22P 50VJ RH	CCRB-812204

REF. NO.	DESCRIPTION	STOCK NO.
C-363, 455, 458	Ceramic 18P 50VJ RH	CCRB-811804
C-391, 442, 467, 468, 469, 804, 805, 806, 807, 813	Feed Through DFT5 0.001μ	CCZY-024001
C-405, 414, 416, 437	Ceramic 7P 50VD RH	CCRB-817092
C-406	Minic 3.3P 500VK	CBAA-823395
C-409	Ceramic 82P 50VJ RH	CCRB-818204
C-411	Minic 1P 500VK	CBAA-821095
C-428	Ceramic 12P 50VJ RH	CCRB-811204
C-453, 457, 463	Tantalum 1μ 25V	CSEA-511090
C-466	Feed Through CZ-023 3P	CCZY-023001
C-801, 802	Ceramic 15P 50VJ RH	CCRB-811504
C-803	Feed Through 47P	CCZY-023004
C-808, 812	Feed Through 18P	CCZY-023002
C-809	Feed Through 33P	CCZY-023005
C-814	Electrolytic 2200μ 16V	CCZY-026001
CT-251, 252, 253, 254, 401	Trimmer Condenser CV-028	CCVY-028004
CT-451, 452, 453	Trimmer Condenser CV-024	CCVY-024004
CT-454	Trimmer Condenser CV-037	CCVY-037001
CT-501	Trimmer Condenser CV-028	CCVY-028002
RESISTORS		
R-101, 108, 151, 210, 211, 214, 215, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312 359, 361, 364, 365, 367, 371, 372, 373, 409, 410, 414,	Carbon 100K 1/4WJ	RUBZ-141044
R-102, 109, 153, 416	Carbon 220K 1/4WJ	RUBZ-142244
R-103, 110, 154, 203, 216, 417	Carbon 82K 1/4WJ	RUBZ-148234
R-104, 111, 155, 156, 164, 166, 169, 170, 172, 173, 320, 330, 356, 363, 369, 374, 377, 385, 411, 412, 424, 425, 503	Carbon 100 1/4WJ	RUBZ-141014
R-105, 152, 415	Carbon 330K 1/4WJ	RUBZ-143344
R-106, 112, 160, 268 273, 280, 282, 362, 386, 404, 408	Carbon 220 1/4WJ	RUBZ-142214
R-107	Carbon 2.2M 1/4WJ	RUBZ-142254
R-157, 158, 213, 269, 321, 360, 401, 405	Carbon 22K 1/4WJ	RUBZ-142234
R-159, 171, 179, 201, 209, 218, 253, 257, 258, 260, 261, 262, 263, 264, 271, 276, 314, 318, 382	Carbon 2.2K 1/4WJ	RUBZ-142224
R-161, 175, 176, 202, 207, 221, 251, 252, 255, 259, 265, 267, 270, 277, 278, 281, 331 332, 379, 402, 406, 551, 555, 556, 557, 674, 679	Carbon 10K 1/4WJ	RUBZ-141034
R-162, 285	Carbon 27K 1/4WJ	RUBZ-142734
R-163	Carbon 270 1/4WJ	RUBZ-142714
R-165, 174, 178, 212, 284, 287, 313, 325, 334, 353, 381, 384, 403, 407, 421, 552	Carbon 1K 1/4WJ	RUBZ-141024
R-167, 168, 266, 272, 274, 279, 288, 323	Carbon 1.5K 1/4WJ	RUBZ-141524
R-177, 205, 351	Carbon 3.3K 1/4WJ	RUBZ-143324
R-180, 428,	Carbon 82 1WJ	RPBK-108204
R-204, 217, 319, 326, 358, 380	Carbon 15K 1/4WJ	RUBZ-141534
R-206, 219, 322, 324, 328, 418, 558, 559, 666, 667, 668, 669, 670, 671	Carbon 470 1/4WJ	RUBZ-144714
R-208, 329, 378	Carbon 560 1/4WJ	RUBZ-145614
R-220	Carbon 5.6K 1/4WJ	RUBZ-145624
R-235	Carbon 220 1/4WJ	RPBZ-142214
R-254, 256, 665, 675, 677	Carbon 47K 1/4WJ	RUBZ-144734
R-275, 283	Carbon 56 1/4WJ	RUBZ-145604
R-286, 327, 422	Carbon 8.2K 1/4WJ	RUBZ-148224
R-315, 316,	Carbon 1.5K 1/4WJ	RPBZ-141524
R-352, 376	Carbon 2.7K 1/4WJ	RUBZ-142724
R-354, 375, 383, 560	Carbon 4.7K 1/4WJ	RUBZ-144724
R-355, 357	Carbon 3.9K 1/4WJ	RUBZ-143924
R-370	Carbon 330 1/4WJ	RUBZ-143314
R-413, 420	Carbon 27 1/4WJ	RUBZ-142704
R-419	Carbon 100 1/4WJ	RPBZ-141014
R-423	Carbon 47 1/4WJ	RUBZ-144704
R-426	Carbon 1.8K 1/4WJ	RPBZ-141824
R-427	Carbon 10 1/2WJ	RPBK-121004
R-451	Carbon 100 1/2WJ	RPBK-121014
R-501, 502	Carbon 470 1/2WJ	RPBK-124714
R-553, 676	Carbon 820 1/4WJ	RUBZ-148214
R-554	Carbon 68K 1/4WJ	RUBZ-146834
R-651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664	Carbon 180 1/4WJ	RUBZ-141814
R-672, 673, 678	Carbon 680 1/4WJ	RUBZ-146814
R-701, 702, 703, 705, 751, 754	Carbon 100K 1/4WJ	RPBZ-141044
R-704	Carbon 10K 1/4WJ	RPBZ-141034
R-752	Carbon 22K 1/4WJ	RPBZ-142234
R-753	Carbon 220K 1/4WJ	RPBZ-142244
R-801	Carbon 2.2M 1/2WJ	RPBK-122254
SWITCHES		
S-801	Rotary Switch SR-119	SSRY-119001
S-802	Rotary Switch SR-041	SSRY-041001
S-804	Switch SW-075	SSWY-075001
S-805	Switch SW-074	SSWY-074001
INDUCTANCE		
L-101, 102, 401, 402, 403, 404, 405, 406, 407,	Coil LA-132	LLAY-132001
L-103, 151	Coil LA-151	LLAY-151001
L-104, 255, 256, 354, 355	Coil LA-145	LLAY-145001
L-152	Coil LA-135	LLAY-135001
L-153	Micro Inductor LZ-001	LLZY-001020
L-154, 351	Micro Inductor LZ-001	LLZY-001021
L-155, 201	Micro Inductor LZ-003	LLZY-003010
L-156	Micro Inductor LZ-002	LLZY-002007
L-251, 252, 301, 409	Micro Inductor LZ-001	LLZY-001013
L-253, 254	Coil LA-058	LLAY-058001
L-257, 352	Micro Inductor LZ-002	LLZY-002013
L-302, 303	Micro Inductor LZ-002	LLZY-002001
L-353	Coil LC-112	LLCY-112001
L-408	Coil LC-111	LLCY-111001
L-451, 452, 454, 456, 457	Coil LE-057	LLEY-057001
L-453	Coil LD-041	LLDY-041001
L-455	Coil LD-040	LLDY-040001
L-501	Coil LD-064	LLDY-064001
L-502, 503	Coil LE-058	LLEY-058001
L-504	Coil LD-018	LLDY-018001
L-801	Coil LE-056	LLEY-056001
L-802	Coil LE-059	LLEY-059001
L-805	Choke Transformer TF-041	TTFY-041001
VARIABLE RESISTORS		
RT-151, 152, 502	Semi-fixed RV-134	RRVY-134014
RT-351	Semi-fixed RV-134	RRVY-134010
RT-501	Semi-fixed RV-134	RRVY-134001
RT-551, 552, 553	Semi-fixed RV-134	RRVY-134008
VR-801	Variable RV-161	RRVY-161001
VR-802	Variable RV-009	RRVY-009001
CRYSTALS		
X-151	Crystal 16.44500	QQXY-072001

REF. NO.	DESCRIPTION	STOCK NO.
X-251	Crystal 14.90278	QQXY-072002
X-252	Crystal 14.90000	QQXY-072003
X-253	Crystal 15.41389	QQXY-072004
X-254	Crystal 15.41111	QQXY-072005
X-301	Crystal 12.80000	QQXY-072006
X-401	Crystal 16.90000	QQXY-072007
MISCELLANEOUS		
PC-135AA	Printed Circuit Board	PPCY-135011
PC-136AA	Printed Circuit Board	PPCY-136011
PC-137AA	Printed Circuit Board	PPCY-137011
PC-138AA	Printed Circuit Board	PPCY-138011
PC-139AA	Printed Circuit Board	PPCY-139011
PC-140AA	Printed Circuit Board	PPCY-140011
PC-141AA	Printed Circuit Board	PPCY-141011
PC-142AA	Printed Circuit Board	PPCY-142011
PC-143AA	Printed Circuit Board	PPCY-143011
PC-144AA	Printed Circuit Board	PPCY-144011
PC-145AA	Printed Circuit Board	PPCY-145011
PC-146AA	Printed Circuit Board	PPCY-146011
PC-147AA	Printed Circuit Board	PPCY-147011
PC-148AA	Printed Circuit Board	PPCY-148011
FT-101	Helical Resonator FL-045	FFLY-045001
FT-151	Crystal Filter FL-035	FFLY-035001
FT-152	Ceramic Filter FL-039	FFLY-039001
FT-153	Ceramic Discriminator FL-015	FFLY-015001
SP-801	Speaker SP-044	ASPY-044001
	Microphone MK-051	AMKY-051001
M-801	Meter MT-066	ZMTY-066001
J-101, 151, 252, 253, 401	Connector, Wafer-Ass'y 2Pin, SD-5045-2A, JK-033, installed in PCB. No. 135, 136, 138, 141	JJKY-033002
J-102, 251, 554, 651	Connector, Wafer-Ass'y 4Pin, SD-5048-4A, JK-032, installed in PCB. No. 135, 138, 144, 146	JJKY-032002
J-103, 153, 204, 205, 403	Connector, 1Pin, MX-1.5SL, installed in PCB. No. 135, 136, 137	JTPY-027001
J-152, 201, 351	Connector, Wafer-Ass'y 5Pin, SD-5048-5A, JK-032, installed in PCB. No. 136, 137, 140	JJKY-032003
J-203, 302, 402, 654	Connector, Wafer-Ass'y 3Pin, SD-5045-3A, JK-033 installed in PCB. No. 137, 139, 141, 146	JJKY-033001
J-301, 552	Connector, Wafer-Ass'y 8Pin, SD-5048-8A, JK-032 installed in PCB. No. 139, 144	JJKY-032006
J-352	Connector, Wafer-Ass'y 7Pin, SD-5048-7A, JK-032 installed in PCB. No. 140	JJKY-032005
J-551, 553	Connector, Wafer-Ass'y 6Pin, SD-5048-6A, JK-032 installed in PCB. No. 144	JJKY-032004
J-652, 653	Connector, Wafer-Ass'y 6Pin, SD-3022-6A, JK-039 installed in PCB. No. 146	JJKY-039005
J-655	Connector, Wafer-Ass'y 7Pin, SD-3022-7A, JK-039 installed in PCB. No. 146	JJKY-039006
J-656	Connector, Wafer-Ass'y 15Pin, SD-3094-15A, JK-046 installed in PCB. No. 146	JJKY-046014
J-701	Connector, Wafer-Ass'y 10Pin, SD-5049-10A, JK-031 installed in PCB. No. 147	JJKY-031008
J-751	Connector, Wafer-Ass'y 4Pin, SD-5049-4A, JK-031 installed in PCB. No. 148	JJKY-031002
J-752	Connector Wafer-Ass'y 20Pin, SDAE-3022-20A, JK-039 installed in PCB. No. 148	JJKY-039019

REF. NO.	DESCRIPTION	STOCK NO.
J-101', 151', 252', 253', 401'	Connector, Housing-Ass'y 2Pin, SD-5051-2, JK-048 suited for Ref. No. J-101, 151, 252, 253, 401	JJKY-048002
J-102', 251', 554', 651', 751'	Connector, Housing-Ass'y 4Pin, SD-5047-4, JK-047 suited for Ref. No. J-102, 251, 554, 651, 751	JJKY-047002
J-103', 153', 204', 205', 403'	Connector, Housing-Ass'y 1Pin, MX-1855TL, TP-016 suited for Ref. No. J-103, 153, 204, 205, 403	JTPY-016001
J-152', 201', 351'	Connector, Housing-Ass'y 5Pin, SD-5047-5, JK-047 suited for Ref. No. J-152, 201, 351	JJKY-047003
J-203', 302', 402', 654'	Connector, Housing-Ass'y 3Pin, SD-5051-3, JK-048 suited for Ref. No. J-203, 302, 402, 654, 902	JJKY-048001
J-301', 552'	Connector, Housing-Ass'y 8Pin, SD-5047-8, JK-047 suited for Ref. No. J-301, 552	JJKY-047006
J-352'	Connector, Housing-Ass'y 7Pin, SD-5047-7, JK-047 suited for Ref. No. J-352	JJKY-047005
J-551', 553'	Connector, Housing-Ass'y 6Pin, SD-5047-6, JK-047 suited for Ref. No. J-551, 553	JJKY-047004
J-652', 653'	Connector, Housing-Ass'y 6Pin, SD-3021-6, JK-036 suited for Ref. No. J-652, 653	JJKY-036005
J-655'	Connector, Housing-Ass'y 7Pin, SD-3021-7, JK-036 suited for Ref. No. J-655	JJKY-036006
J-701'	Connector, Housing-Ass'y 10Pin, SD-5047-10, JK-047 suited for Ref. No. J-701	JJKY-047009
J-702	Connector, Housing-Ass'y 20Pin, SD-3024-20C, JK-061 suited for Ref. No. J-752	JJKY-061019
J-801	Jack JK-051	JJKY-051001
J-802	Phone Jack JK-010	JJKY-010001
J-803	Metal Socket JK-028	JJKY-028001
J-804	Antenna Connector JK-035	JJKY-035001
J-808', 809'	Connector, Housing-Ass'y 3Pin, SD-3021-3, JK-036 suited for IC-801, Q-801	JJKY-036002
	Pin, Terminal for Housing Ass'y, 2759TL.	JTPY-015001
P-801	Plug PG-026	JPGY-026001
TP-251, 252, 351, 401	Test Terminal TP-019	JTPY-019001
FH-801	Fuse Holder FH-009	ZFHY-009001
F-801	Fuse	
	Microphone Hanger YY-016	ZYYY-016001
W-7	DC Cord W-070072	WZDZ-070072
	Cabinet (Top)	MDBC-203512
	Cabinet (Bottom)	MDBC-203513
	Bracket	MDBP-303515
	Front Panel ABS	MDMP-203511
	Knob ABS	MDMP-403502
	Channel Knob (Outside)	MDMP-403520
	Channel Knob (Inside)	MDMP-403521
	Brand Plate AIPI-1/2H0.5t	MDNP-403518
	Control Plate AIPI-1/2H0.5t	MDNP-403516
	Microphone Plate AIPI-1/2H0.3t	MDNP-403517
	FCC Plate AIPI-1/2H0.5t	MDNP-403524
	Channel Window	MDAP-403415
	Styrofoam Box (Front)	MDPP-303582
	Styrofoam Box (Back)	MDPP-303583
	Display Box	MDPP-303525